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**Addressing Health Inequalities:
Mental Health and Health Behaviors in the Face of Discrimination**

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The more we learn, the less we are separated.

Table of Contents

Acknowledgments	5
Contributions Based on This Dissertation	9
Summary	10
General Introduction	13
Social Inequalities in Mental Health	16
Social Discrimination and Mental Health	18
Health Behaviors as Pathways	21
Health Behaviors as Protective Factors	22
Research Aims and Overview	25
Manuscript 1 – The immediate effect of discrimination on mental health: A meta-analytic review of the causal evidence	29
Abstract	30
Introduction	31
Method.....	70
Results	82
Discussion	95
Supplemental Material	117
Manuscript 2 – Long-term discrimination effects on adolescent health behaviors and well-being in four countries	148
Abstract	149
Introduction	150
Method.....	155
Results	162
Discussion	167
Supplemental Material	175
Manuscript 3 – Well-being and cultural identity in migrant acculturative stress: A daily diary study	195
Abstract	196
Introduction	197
Method.....	201
Results	208
Discussion	215
Supplemental Material	220
General Discussion	230
Summary of Findings	230
Integration of Findings and Theoretical Implications	234
Strengths, Limitations, and Future Research.....	242
Practical Implications	248
Conclusion.....	249
References	251
Statements of Co-Authors	297

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Contributions Based on This Dissertation

This dissertation contains a research program that has been published or prepared for publication as follows:

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Summary

Social inequality is a major challenge for public health, leading to mental health inequalities through discrimination as one pathway. However, there has been a lack of clear causal evidence demonstrating the adverse mental health effects of discrimination, with existing research primarily focusing on observational cross-sectional analyses. Additionally, potential modifiable mechanisms and protective factors have remained largely unclear. To address these research gaps, I examined the effects of discrimination on mental health through different methodological approaches enhancing causal inference and capturing varying temporal resolutions, including immediate direct effects, daily dynamics, and long-term consequences. This dissertation emphasizes health behaviors as both mediators and moderators of the effects of discrimination on mental health, highlighting health behaviors as crucial yet overlooked levers to reduce mental health inequalities.

In Manuscript 1, I investigated the causal effects of discrimination on mental health through a systematic meta-analysis of experimental studies and provided a comprehensive review of theories and mechanisms. The meta-analysis included 245 effect sizes from 73 studies with 12,097 participants. The results confirmed that experimentally induced discrimination immediately led to poorer mental health outcomes. Gender and age did not moderate the effect, potentially due to the predominant use of convenience samples (mostly female university students). Group status—whether participants possess marginalized or non-marginalized identities targeted by discrimination, such as identifying as female versus male in a manipulation of sexism—showed a trend toward stronger effects for marginalized identities. Discrimination manipulated to be pervasive across time and contexts showed stronger mental health effects than isolated single events. To advance future research, I further developed a first taxonomy of experimental research paradigms. Overall, through this study, I was able to: a) provide a systematic meta-review of relevant theories and mechanisms explaining the adverse effects of discrimination on mental health, b) clearly demonstrate its

immediate direct and causal effects, c) highlight important moderators, d) specify the first taxonomy of experimental paradigms to induce discrimination, and e) identify gaps in current experimental discrimination research, primarily involving selective samples of young women with higher education from the US.

In Manuscript 2, I examined the long-term effects of perceived discrimination on mental health and health behaviors as mediators by utilizing a research design with greater ecological validity than experimental studies. I analyzed data from 9,957 adolescents ($M_{age} = 14.90$) from the CILS4EU multinational panel (a longitudinal survey in four European countries) with three annual assessments. This study targeted adolescents as a particularly vulnerable but often overlooked population group in health and discrimination research and focused on well-being as a key aspect of mental health. Perceived discrimination predicted decreased well-being two years later as well as decreased protective health behaviors (physical activity, nutrition, and sleep) and increased risky health behaviors (substance use) one year later. Nutrition and sleep mediated the relationship between perceived discrimination and well-being, while no mediation was found for physical activity and substance use. This study demonstrates that a) discrimination begins early in life, b) its detrimental long-term effects on mental health are visible even in observational data with two-year time intervals, and c) these effects are partially mediated through changes in health behaviors.

Protective health behaviors can help reduce the impact of psychosocial stressors. However, discrimination can negatively affect these health behaviors, worsening its overall impact on mental health. In Manuscript 3, I examined physical activity as a protective factor against migration-specific acculturative stressors, including experiences of discrimination, work challenges, language barriers, intercultural relations, and cultural isolation. I focused on their daily associations with well-being (positive and negative affect) and cultural identity (ethnic and national identity) and tested physical activity as a moderator. Results of a daily diary study with 266 participants (1,473 observations) demonstrated that acculturative stress

was associated with lower well-being and national disidentification but not ethnic identification. In additional analyses, experiences of discrimination emerged as the strongest predictor compared to the other stressors. Physical activity was linked to higher well-being amidst acculturative stress and showed a statistically non-significant tendency to buffer its association with negative, but not positive affect. Being physically active was not associated with cultural identity. Exploratory analyses indicated that stronger national and ethnic identity correlated with higher well-being and exacerbated the relation of acculturative stress with well-being. Overall, results demonstrate that a) individuals with a migration background face daily acculturative stressors that might adversely affect their well-being and cultural identity, b) physical activity appears to be a promising tool to strengthen well-being amidst discrimination and further minority stressors in day-to-day life, and c) social identity can be a vulnerability factor enhancing effects of discrimination on mental health.

In sum, this dissertation establishes discrimination is a significant stressor for minority groups. Employing a multimethodological approach, I demonstrate its adverse mental health effects immediately in laboratory settings, daily in a field setting, and over two years in a panel study. This research revealed that discrimination influences both risky and protective health behaviors, which can mediate the mental health effects of discrimination. Additionally, by focusing on physical activity within migrant populations—a group notably underrepresented in psychological research—this work illustrated that health behaviors can also act as moderators in the context of discrimination, highlighting their vital importance for vulnerable groups and reducing mental health inequalities.

General Introduction

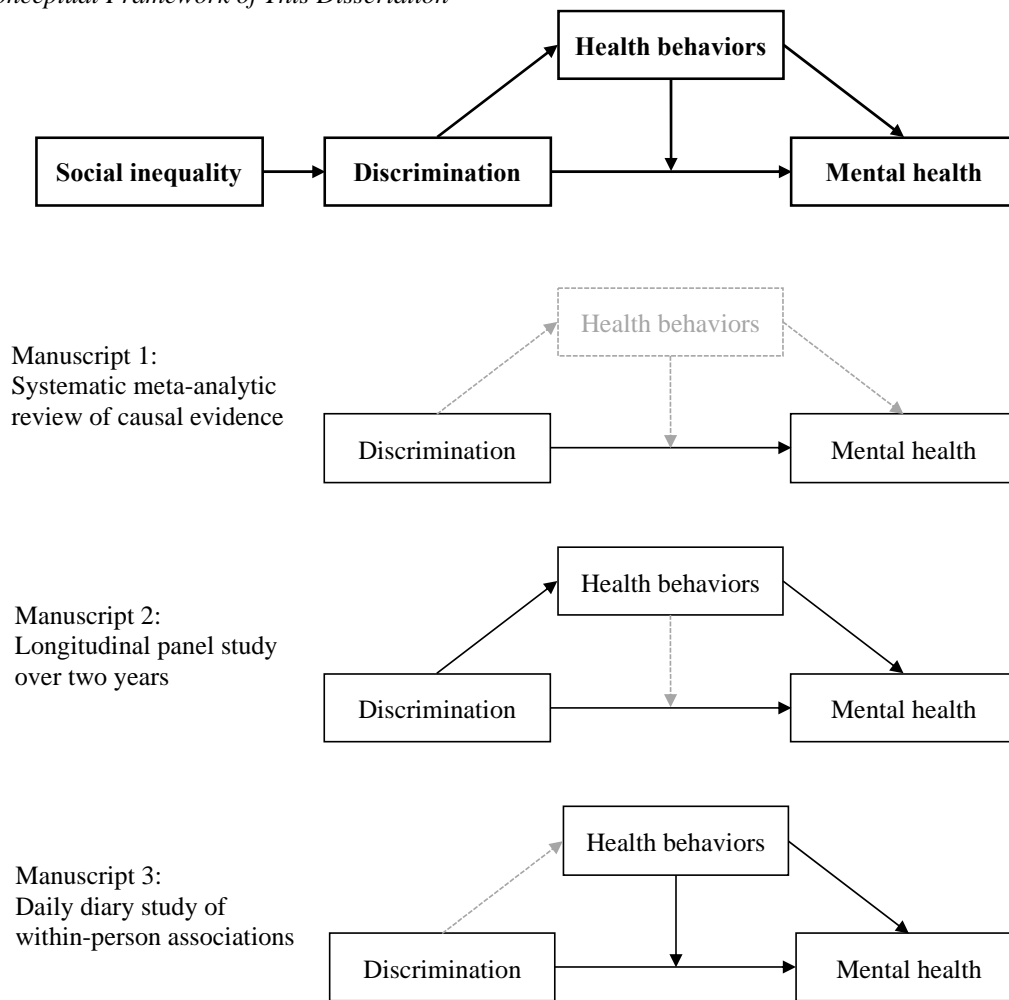
Mental disorders are a major contributor to the global burden of disease, affecting not only individual well-being but also imposing broader social and economic challenges (Rehm & Shield, 2019; Vigo et al., 2016). Importantly, this burden is not evenly distributed among populations and is closely linked to social inequality (Lund et al., 2018). For instance, migrant populations in Europe are twice as likely to develop a psychotic disorder compared to non-migrant populations, with this risk increasing to four times among migrants from marginalized ethnic groups (Selten et al., 2020). Furthermore, children and adolescents affected by socioeconomic disadvantage are two to three times more likely to develop mental health problems than their more advantaged peers (Reiss, 2013), a disparity that persists into adulthood (Freeman et al., 2016; Kivimäki et al., 2020). Women are twice as likely to experience major depressive disorders and face more severe symptoms compared to men (Salk et al., 2017), while transgender and gender-diverse individuals encounter even higher mental health burdens and associated risks (Newcomb et al., 2020; Saunders et al., 2023). Sexual minorities also face elevated risks for a range of mental health problems, including notably higher rates of suicide attempts and suicide compared to the heterosexual majority (Plöderl & Tremblay, 2015). The magnitude of these mental health inequalities¹ might be largely underestimated, as those most affected by social disadvantage are less likely to access mental health services despite significant needs (e.g., Packness et al., 2017; Villatoro et al., 2018). Moreover, these groups are highly underrepresented in health research, limiting the development of targeted interventions and the effectiveness of existing interventions for

¹ Health inequalities encompass all differences in health, while health inequities specifically refer to unjust differences that affect marginalized population groups (World Health Organization, 1985). Health equity aims to reduce these injustices by ensuring fair opportunities for all to achieve optimal health (Whitehead, 1990). This dissertation focuses on health inequities stemming from discrimination with systemic and structural dimensions. Given that the evaluation of equity can be subjective and contentious, I utilize the concept of equality as a lens to examine the causes and promoting factors of health equity (cf. Braveman & Gruskin, 2003).

subpopulations, further reinforcing existing inequalities (e.g., Finegan et al., 2018; van Dyck et al., 2023; Western et al., 2021).

Despite global commitments to reduce social inequalities in health (United Nations, 2015; World Health Organization, 2009), these inequalities continue to widen within many countries (Gutin & Hummer, 2021). Understanding underlying, ideally modifiable, causes and mechanisms is essential to address mental health inequalities effectively. In this dissertation, I focus on social discrimination as a key cause of reduced mental health in socially disadvantaged groups, resulting in mental health inequalities (Bauer & Scheim, 2019). Additionally, I aim to identify potential underlying mechanisms and moderators of the effects of discrimination to identify important levers for mitigating social inequalities in mental health. In the following sections, I will first elaborate on social inequalities in mental health. Subsequently, I will review relevant literature on discrimination as a central driving force for mental health inequalities and discuss the role of health behaviors as potential mediators and protective factors buffering the negative effects of discrimination. I will then outline the theoretical framework, provide an overview of the research program, and describe the methodological approaches of my projects. The three manuscripts comprising this dissertation will detail the research I conducted on the mental health effects of discrimination and the role of health behaviors both as mechanisms (Manuscript 2) and as moderators of this effect (Manuscript 3). The studies capture immediate (Manuscript 1), day-level (Manuscript 3), and long-term effects (Manuscript 2) of discrimination on mental health. Figure 1 displays the overall conceptual framework of this dissertation and the respective research objectives of each included manuscript.

Figure 1
Conceptual Framework of This Dissertation



Note. The first row represents the overarching theoretical framework underlying this dissertation. The subsequent rows offer detailed insights into each individual manuscript, highlighting specific methodology and key research focus.

Social Inequalities in Mental Health

Social inequality refers to the unequal distribution of mental health outcomes and associated resources and risk factors based on an individual or group's position within an economic and social hierarchy (e.g., Shaw et al., 2007). To determine this position, multiple dimensions are involved, and along these, mental health outcomes are socially stratified. Dimensions of inequality are not independent; according to intersectionality theory, they are interrelated, and their intersections significantly influence an individual's social position (Hankivsky & Christoffersen, 2008). Commonly studied indicators of social inequality dimensions to predict health outcomes include measures of socioeconomic position, gender, and race/ethnicity (Shaw et al., 2007; World Health Organization, 2010). However, these indicators alone are insufficient to analyze social inequality in health outcomes comprehensively. In health research, the PROGRESS-Plus framework (O'Neill et al., 2014) is widely used to systematically describe differential outcomes of interventions and health outcomes. This framework includes a broad spectrum of social inequality indicators: Place of residence, Race/ethnicity/culture/language, Occupation, Gender/sex, Religion, Education, Socioeconomic status, and Social capital. The "Plus" component incorporates additional factors that may contribute to social disadvantage, such as personal characteristics linked to discrimination (e.g., body weight, disabilities), social characteristics (e.g., cohabitation status, parental smoking), and time-dependent conditions that may temporarily affect an individual (e.g., post-hospitalization, receiving respite care).

Reducing social inequalities in mental health is crucial not only from an ethical perspective and the acknowledgment of health as a fundamental right but also due to its extensive societal implications. The Constitution of the World Health Organization (1948) emphasizes that every individual deserves the highest attainable standard of physical and mental health, positioning it as a universal right central to social justice. Moreover, health inequalities often mirror and intensify underlying societal and economic inequalities, thereby

creating a vicious cycle where poor mental health diminishes socioeconomic opportunities and freedom, which in turn, worsens mental health outcomes (Marmot et al., 2012; World Health Organization, 2010). This escalating cycle contributes to increasing social inequality, leading to broader societal issues—that are particularly salient today—, such as decreased social cohesion and the rise of extremism (Kunst & Obaidi, 2020), as well as worsening environmental conditions (Cushing et al., 2015). Addressing mental health inequalities is therefore not only about improving individual health outcomes but also about ensuring the well-being and stability of society as a whole.

Mental Health as a Social Phenomenon

The concept of mental health extends beyond the mere absence of mental disorders; it encompasses a positive state of well-being and premises quality of life, successful self-realization, and productive contributions to society. Mental Health, therefore, is an intrinsic part of individual and collective well-being (World Health Organization, 2022). This comprehensive perspective on mental health highlights the importance of an enabling social, economic, and physical environment where individuals can thrive (Allen et al., 2014). The Rainbow Model of Social Determinants of Health (Dahlgren & Whitehead, 2006, 2021) provides a comprehensive framework to understand these social determinants. It highlights that health outcomes are influenced by layers beyond individual choices or genetic predispositions, including lifestyle factors, social and community networks, living and working conditions, and broader socioeconomic, cultural, and environmental contexts. According to Diderichsen et al. (2019), inequalities in health arise through four mechanisms that operate on these social determinants: differential access to power and resources, differential exposure to health risks, differential vulnerability to health issues, and differential consequences of illness. One factor that impacts all these mechanisms is discrimination. In the Social Determinants of Health Rainbow Model, discrimination is understood as an overarching determinant—a driving force that influences all health determinants and thereby

affects the social patterning of these determinants (Dahlgren & Whitehead, 2021). To effectively address mental health inequalities, it is thus crucial to understand discrimination's pervasive role in shaping mental health outcomes.

Social Discrimination and Mental Health

Discrimination is a pivotal factor through which social disadvantage leads to mental health inequalities (Bauer et al., 2021; Krieger, 2021). It involves the unfair or prejudicial treatment of individuals based on their actual or perceived membership in historically disadvantaged social categories such as marginalized ethnic, gender, religious, or sexual minorities (American Psychological Association, 2019; Link & Phelan, 2001). The pervasive impact of discrimination on mental health manifests across cultural, institutional and structural, and individual levels. At the cultural level, the ideology of the inferiority of certain social groups is inherent in cultural aspects, such as norms, language, symbols, and assumptions (D. R. Williams et al., 2019). The internalization of these prejudices impacts mental health through psychological mechanisms such as self-stigmatization (Corrigan & Rao, 2012), stigma consciousness (Pinel, 1999), and stereotype threat (Steele, 1997). The institutional level describes discrimination through state and non-state institutions, such as healthcare, criminal justice, and education (Krieger, 2014). Structural discrimination refers to the resulting systems that reinforce discriminatory beliefs and lead to unequal distribution of opportunities, resources, and risks (Krieger, 2014). Institutional and structural discrimination affects mental health by limiting access to education and employment opportunities, and health-enhancing resources, as well as higher exposure to chronic and psychosocial stressors and other health risk factors (D. R. Williams et al., 2019). At the individual level, interpersonal discrimination describes direct interactions between people, including blatant and overt forms of unfair treatment and more frequent subtle and less conscious forms, such as microaggressions (K. P. Jones et al., 2016; M. T. Williams, 2021). Current psychological research on the mental health effects of discrimination predominantly focuses on interpersonal

discrimination and utilizes stress and coping approaches. These frameworks are based on the social stress theory (Pearlin, 1999; Pearlin et al., 1981) and the transactional model of stress and coping (Lazarus & Folkman, 1984). Perceived discrimination is conceptualized as a psychosocial stressor that activates biopsychosocial and behavioral stress responses that impact mental health (Pascoe & Smart Richman, 2009; D. R. Williams & Mohammed, 2009). Discrimination is considered particularly harmful to mental health due to its uncontrollability, unpredictability, and pervasive chronic nature (D. R. Williams & Mohammed, 2009, 2013).

Due to the extensive and multifaceted effects of discrimination on mental health, this topic is examined from the perspectives of various disciplines, including psychology, sociology, medicine, public health, epidemiology, anthropology, and many others. This diversity in perspectives results in a vast body of literature, often using differing terminologies and frameworks. However, to date, there is no comprehensive overview of theories and potential mechanisms integrating these diverse perspectives. To address this research gap, I provide a systematic review and critical examination of the theories and mechanisms explaining the mental health effects of discrimination in Manuscript 1.

Evidence for a Causal Relationship between Discrimination and Mental Health

Meta-analytic reviews consistently demonstrated negative associations between self-reported experiences of discrimination and mental health outcomes (e.g., Emmer et al., 2020; Pascoe & Smart Richman, 2009; Schmitt et al., 2014). However, these meta-analyses rely on correlational evidence and primarily focus on broad, retrospective assessments of subjectively perceived discrimination over extended time periods. A synthesis of experimental evidence is therefore crucial for quantifying the causal effects of discrimination on mental health and examining potential moderators influencing these effects. The only meta-analysis of causal effects published approximately 10 years ago (Schmitt et al., 2014) found no overall effect of discrimination on mental health in experimental studies. Still, moderator analyses revealed a negative impact on mental health from pervasive experimental manipulations of

discrimination (i.e., perceived systemic discrimination that occurs frequently or repeatedly over time and across multiple contexts) but not from often utilized single-event studies (i.e., isolated single instances of perceived discrimination). Conducting an updated meta-analysis of experimental studies, incorporating research from the past decade and considering a broader range of experimental manipulations, would provide an urgently needed overview of the current experimental research. This would enable more detailed analyses, including the examination of a larger set of potential protective and vulnerability factors, as well as a critical review of experimental paradigms. In Manuscript 1, in addition to providing a systematic theory review, I thus (a) provide an updated and comprehensive meta-analytical synthesis of experimental research on the mental health effects of discrimination, (b) test potential moderators of this effect, and (c) develop the first taxonomy for experimental paradigms.

Temporal Resolution of Discrimination Effects

Existing theories and empirical research have predominantly focused on the longer-term consequences of discrimination. However, discrimination, particularly through subtle forms such as microaggressions, is a frequent everyday experience, often encountered multiple times daily (e.g., English et al., 2020). Everyday perceptions of discrimination signal a threatening environment (D. R. Williams & Mohammed, 2013) and can lead to mental health disorders over time through the cumulative effects of repeated affective, cognitive, and physiological stress responses (e.g., Leger et al., 2022; Ong et al., 2022). Initial evidence suggests that higher exposure to daily stressors can partially explain socioeconomic mental and physical health inequalities (Almeida et al., 2005). The effects of everyday experiences of discrimination are central to its overall effect on mental health, with the effects of daily life stressors sometimes even exerting a greater impact than major life events (e.g., Thoits, 2010). A deeper understanding of the temporal dynamic of discrimination effects, including a closer look at immediate and day-level effects, is essential for identifying potentially varying

outcomes, underlying mechanisms, and protective factors to reduce social inequalities in mental health. To address this research gap and to get a more differentiated picture of the temporal dynamics of discrimination effects, I look at the effects at three different temporal scales: immediate impacts in Manuscript 1, short-term associations at a daily level in Manuscript 3, and long-term consequences over a period of two years in Manuscript 2.

Health Behaviors as Pathways

Like other psychosocial stressors, discrimination can also impact mental health through a behavioral pathway by adversely affecting health behaviors (Pascoe et al., 2022). Health behaviors, including protective behaviors such as physical activity, nutrition and eating behaviors, and sleep, as well as avoidance of risky behaviors, such as alcohol, cigarette, or illicit drug use (Conner, 2001), are crucial determinants of mental health. The mental health benefits of health behaviors have been demonstrated in numerous reviews and meta-analyses (e.g., for physical activity: Biddle et al., 2019; Rosenbaum et al., 2014; healthy nutrition and eating behavior: Adan et al., 2019; Zahedi et al., 2022; sleep quality and quantity: Chaput et al., 2016; Scott et al., 2021; and avoidance of substance use: Esmaeelzadeh et al., 2018).

According to the meta-analysis by Pascoe et al. (2022), experiences of discrimination are associated with less healthy behaviors. General psychosocial stress has been shown to predict less leisure-time physical activity (Mouchacca et al., 2013) and impaired sleep over time (Åkerstedt, 2006). Additionally, unhealthy behaviors, such as substance use and stress-induced eating, are often used as a coping strategy to mitigate the immediate adverse physiological and psychological stress responses triggered by discrimination (Brown et al., 2021; Gerrard et al., 2012; Gibbons et al., 2018). Discrimination also impacts health behaviors in distinct ways, such as limiting access to resources on both individual and institutional levels. This can include lower quality of health care (Cook et al., 2014), limited safe spaces for physical activity (B. A. Jones et al., 2017), and greater exposure to addictive substances and unhealthy foods in deprived areas (Krieger, 2020; Schneider & Gruber, 2013).

Additionally, attempts to restore a sense of belonging threatened by discrimination can lead to substance use, as it often occurs in social settings (Smart Richman & Leary, 2009).

Most empirical studies on discrimination and health behaviors are cross-sectional and observational in nature and primarily focus on risk behaviors as mediators, particularly substance use, while largely overlooking protective health behaviors (Pascoe et al., 2022). The few longitudinal studies investigating risky health behaviors as mediators consistently show that the consumption of alcohol, cigarettes, and other illicit drugs is an important pathway for adverse long-term mental health effects of discrimination (e.g., Gibbons et al., 2018; Yang et al., 2019). I address this research gap in Manuscript 2, where I investigate both protective and risky health behaviors—namely, physical activity, nutrition, sleep, and substance use—as mediators in the longitudinal effects of discrimination on mental health. I aim to capture the long-term consequences of discrimination on health behaviors and mental health during adolescence as a critical life phase for establishing health behavior patterns (Viner et al., 2012). Adolescent health behaviors are not only associated with concurrent health outcomes but, importantly, also have long-term consequences that extend into adulthood (Burdette et al., 2017). At the same time, adolescents are especially vulnerable to discrimination due to heightened responsiveness to social evaluation and rejection (Somerville, 2013) and limited capabilities to cope with discrimination (Compas et al., 2017). Therefore, interventions aimed at preventing discrimination and mitigating its effects on adolescent health and health behaviors are crucial to hinder the amplification of health inequalities over the life course.

Health Behaviors as Protective Factors

Health behaviors serve multiple roles in relation to discrimination and its impact on mental health. Not only are they direct outcomes of discriminatory experiences and significant pathways through which discrimination influences mental health, but they can also buffer the detrimental impact of psychosocial stressors on mental health. Importantly, unlike

more stable interindividual characteristics, such as social support (Raffaelli et al., 2013) or optimism (Kleiman et al., 2017), that have been identified as potential buffers for mental health against stress in general, health behaviors are modifiable and tend to vary in daily life, making them crucial targets for interventions.

Discrimination research primarily focuses on substance use (e.g., Desalu et al., 2019; Gerrard et al., 2012) and stress-induced unhealthy eating (e.g., Kazmierski et al., 2021) as disengagement coping strategies. These behaviors may provide temporary relief from stress, but in the longer term increase biological and psychological stress loads and exacerbate the stress response through dysregulation of the stress system (Fosnocht & Briand, 2016; Perez-Tejada et al., 2019). Moreover, they can lead to serious long-term health issues, such as addiction (Kalin, 2020), eating disorders (Berridge, 2009), or obesity-related illnesses (Dallman, 2010).

Physical Activity as a Protective Factor

Research on general psychosocial stress identifies physical activity as a central protective factor for mental health. Regular physical activity can decrease physiological stress responses (so-called cross-stressor adaptation hypothesis; von Haaren et al., 2016). Acute physical activity can also reduce subsequent physiological reactions to a stressor, thus buffering their negative consequences on health (Zschucke et al., 2015). Moreover, engaging in more complex forms of physical activity provides psychological distraction from stressors, further explaining its stress-buffering effects (Craft, 2005). Experimental studies confirm that acute physical activity buffers the immediate adverse mental health effects induced by stressful tasks (Caplin et al., 2021) or negative mood inductions (Mata et al., 2013). However, stress experiences, including perceived discrimination, and behaviors such as physical activity are not static but vary significantly within the same person over time. Intensive longitudinal studies capturing this variability, for instance, by Flueckiger et al. (2016) or Puterman et al. (2017), show that physical activity acts as a protective buffer against general daily life stress,

with participants reporting smaller decreases in well-being on stressful days when they were more active than usual.

Physical activity is often highlighted as a protective factor for mental health, specifically within the context of international migration. This is not only due to its physiological stress-buffering effects but largely due to its pronounced social aspects that facilitate integration and foster a sense of belonging (systematically reviewed by Eime et al., 2013). Indeed, a study by Copeland et al. (2021) indicated that regular physical activity mitigated the detrimental effects of racial discrimination on allostatic load, a biological stress marker. This research stands out as the only research explicitly examining protective health behaviors as a buffer against the effects of discrimination. However, its reliance on self-reported discrimination and physical activity over the previous year may introduce recall bias, particularly as discrimination often occurs multiple times daily in subtle forms (English et al., 2020). Accurately recalling such events can be challenging, underscoring the need for real-time or proximate assessments. Furthermore, despite the significant and ongoing increase in international migration (Clement et al., 2021), migrant populations are still underrepresented in health research (e.g., Cobb et al., 2019). In Manuscript 3, I address these limitations by employing a daily diary methodology to examine physical activity as a daily protective factor against the adverse mental health impacts of discrimination in migrant populations. This approach allows for a more immediate examination of how both discrimination and physical activity interact and impact mental health on a daily basis. Notably, besides discrimination and daily affect, I also explored other migration-specific acculturative stressors as further predictors and cultural identity as an additional emotional integration outcome. I chose to focus on physical activity for three key reasons: 1) substantial evidence supports its efficacy in buffering general psychosocial stress, with preliminary evidence for discrimination-induced stress, 2) it is quantifiable and easily measurable (also on a daily basis), and 3) it can be

effectively manipulated and promoted in future experimental studies and large-scale interventions.

Research Aims and Overview

The overarching aim of this dissertation is to advance our understanding of health inequalities by systematically investigating the impact of discrimination on mental health. Investigating how discrimination influences mental health is crucial not merely to demonstrate the extent of its harmful effects but to understand the factors that contribute to individual vulnerability and resilience (Krieger, 2014). This understanding is key to developing effective strategies that ultimately reduce social inequalities in health. The current literature discloses several gaps that this dissertation aims to address:

- 1) Providing a systematic and critical review of theories and mechanisms by which discrimination affects health (Manuscript 1),
- 2) examining the causality (Manuscripts 1 and 2) and
- 3) the temporal dynamics of these effects (Manuscripts 1, 2, and 3), and
- 4) exploring the role of health behaviors both as potential mechanisms (Manuscript 2) and as moderators (Manuscript 3).

In Manuscript 1, I examine the immediate effects of discrimination in experimental settings, addressing the causality of its impact on mental health, and provide a comprehensive, systematic meta-review of theories and mechanisms explaining these effects. To advance future research, I further develop the first taxonomy of experimental research paradigms and critically discuss the ethical and ecological limitations of experimental research on discrimination. Manuscript 2 explores the long-term effects of discrimination on mental health two years later, focusing on health behaviors one year later as longitudinal mediators in these effects. In Manuscript 3, I examine daily associations of discrimination and further minority stressors with mental health in real-life contexts with high ecological validity and investigate physical activity as a protective moderator of these associations. In this research

program, I thus investigate the effects of discrimination across varying durations: immediate impacts in experimental studies (Manuscript 1), short-term effects in a daily diary study (Manuscript 3), and long-term effects over two years in a longitudinal panel study (Manuscript 2). Each manuscript contributes uniquely to the comprehensive understanding of the temporal resolutions by utilizing tailored methodological approaches. The subsequent section will provide an overview and detailed description of the methodological approaches used. In a nutshell, this dissertation investigates whether, when, and how discrimination influences mental health and explores the mediating and moderating roles of health behaviors.

Multimethodological Approach

To gain a more holistic understanding of discrimination and its mental health effects, I employed a variety of methods in the research projects included in this dissertation. In Manuscript 1, I conducted a systematic review and meta-analysis of experimental studies, focusing on randomized controlled trials (RCTs). RCTs are considered the gold standard for establishing causality, as they robustly minimize the influence of external variables (Berlin & Golub, 2014; Hariton & Locascio, 2018). Systematically synthesizing data from multiple RCTs integrates findings for more robust conclusions and broadens our understanding of effects across diverse populations and settings. Furthermore, it allows for testing potential population- or design-related moderators of a potential effect. Hence, systematic meta-analyses of RCTs provide the best source of evidence in health-related research (Berlin & Golub, 2014). This comprehensive approach further ensures a thorough representation of current empirical evidence and facilitates the identification of research gaps. However, despite their high internal validity, experimental studies often face challenges related to external and ecological validity and frequently rely on small convenience samples (Kam et al., 2007; Schram, 2005).

For Manuscript 2, I analyzed a longitudinal transnational dataset, the Children of Immigrants Longitudinal Survey (CILS4EU), conducted in four European countries

(Germany, England, Netherlands, and Sweden) with over 18,000 adolescent participants. The utilized survey provides a certain level of representativeness and sample sizes rarely achievable in primary data collection for experimental studies. This high statistical power facilitates the detection of small effects. Moreover, its longitudinal design with three annual assessment waves allows for investigating changes over time and supports conducting longitudinal mediation analysis by temporally separating predictor, mediator, and outcome variables. Although the longitudinal observational assessment does not establish causality as rigorously as experimental designs, it strengthens causal inference compared to cross-sectional designs (O’Laughlin et al., 2018) and establishes temporal precedence between variables, thereby reducing common method bias (Podsakoff et al., 2024). However, relying on secondary data, as in both Manuscript 1 and Manuscript 2, limits control over data collection and the specific measurement instruments used.

In Manuscript 3, I collected primary daily diary data, which, in contrast to Manuscripts 1 and 2, allowed for targeted data collection and tailoring measurement instruments specifically to the study's research questions. The within-person comparisons require smaller sample sizes and enable control over potential confounders and interindividual differences, enhancing the validity of findings. Applying a micro-level analysis of daily assessments provides high temporal resolution, reduces recall bias, and provides rich data on everyday experiences and behaviors and within-person dynamics. Although the observational nature of this approach does not enable causal inferences, it allows for exploring ecologically valid dynamic relationships on a daily basis.

The multimethodological approach of this dissertation facilitates a nuanced understanding of the causal effects of discrimination on mental health across different temporal resolutions. Moreover, this approach allows for a comprehensive examination of health behaviors both as long-term mechanisms and acute moderators. Figure 1 provides an overview of the research program, including methodologies and corresponding research

objectives addressed in each individual manuscript of this dissertation, which are detailed in the following three sections of this dissertation (Manuscripts 1 to 3). In the subsequent general discussion, I synthesize the key findings of the three manuscripts, integrate them into the broader literature, and discuss important methodological and theoretical implications. I further outline the central strengths and limitations of this research and propose avenues for future research and practical applications.

Manuscript 1 – The immediate effect of discrimination on mental health: A meta-analytic review of the causal evidence

Published Article:

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Aside from minor changes to the format, the manuscript included in this dissertation reflects the postprint version of the article that was accepted for publication.

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Abstract

This meta-analysis synthesizes experimental studies on the immediate effects of discrimination on mental health, exploring the effects of different paradigms and discrimination types on diverse facets of mental health. We analyzed data from a systematic literature search (73 studies; 12,097 participants; 245 effect sizes) for randomized controlled trials with manipulation of discrimination as a predictor and mental health as an outcome using a three-level random-effects model. Experimentally manipulated discrimination led to poorer mental health ($g = -0.30$), also after controlling for publication year, region, education level, and methodological quality. Moderator analyses revealed stronger effects for pervasive ($g = -0.55$) compared to single-event manipulations ($g = -0.25$) and a trend toward weaker effects for samples with nonmarginalized ($g = -0.16$) compared to marginalized identities ($g = -0.34$). Gender and age did not moderate the effect. Discrimination had the largest effects on externalizing ($g = -0.66$) and distress-related outcomes ($g = -0.41$); heterosexism ($g = -0.66$), racism ($g = -0.32$), and sexism ($g = -0.30$) had the largest effects on mental health. Convenience sampling compromised generalizability to subgroups and the general population, downgrading methodological quality for all included studies. When interpreting the findings, selective samples (mostly young female adults with higher education), often limited ecological validity, and ethical restrictions of lab-induced discrimination need to be considered. These constraints likely led to conservative estimates of the mental health effects of discrimination in this meta-analysis. Future research should investigate more diverse samples, further explain the heterogeneity of findings, and explore protective factors of the effects of discrimination on mental health.

Introduction

More than 70 years ago, the Universal Declaration of Human Rights established the essential premise that all people should be valued equally and treated fairly. Yet today, millions of people globally face situations of discrimination in their daily lives (Office of the United Nations High Commissioner for Human Rights, n.d.). U.S. adolescents self-identifying as African American or Black have reported experiencing an average of more than five instances of racial discrimination per day (English et al., 2020). Women in the workforce continue to be impeded by gender stereotypes (Heilman, 2012), and people with overweight suffer from being stigmatized and socially rejected (Emmer et al., 2020). The mistreatment and disadvantages resulting from different types of discrimination represent a threat to the fundamental human rights of equality and psychological well-being (e.g., Schmitt et al., 2014). Meta-analytic reviews have yielded consistent findings of the negative associations between self-reported experiences of discrimination and various mental health indicators (e.g., Pascoe & Smart Richman, 2009; Schmitt et al., 2014), based on correlational evidence. A synthesis of experimental evidence is essential to quantify the causal effect of discrimination on mental health and to examine the factors influencing this causal effect. The first meta-analysis on causal effects, published about 10 years ago (Schmitt et al., 2014), showed a negative effect on mental health for pervasive experimental manipulations of discrimination (i.e., perceived systemic discrimination that occurs frequently or repeatedly over time and across multiple contexts), not for single-event studies (i.e., isolated single instances of perceived discrimination) that are commonly used in experimental research. In the current meta-analysis, we considered a wider range of experimental manipulations that allowed us to examine a larger set of potential moderators and to perform more detailed analyses. This was possible in part because we set broader inclusion criteria but also because there have been advancements in meta-analytical methods as well as numerous new relevant experimental studies published in the last decade.

Levels of Discrimination

Discrimination describes the unfair or prejudicial treatment of people based on their actual or perceived membership in groups or social categories such as ethnicity, gender, age, or sexual orientation (American Psychological Association, 2019). Discrimination and prejudice are key aspects of *stigma*. Stigma relies on social, economic, and political power structures and describes a negative attribute or characteristic that associates an individual with undesirable traits (Link & Phelan, 2001). These negative attributes or characteristics convey a social group identity that is devalued, discriminated against, and marginalized in certain social contexts (Crocker et al., 1998), often also called *marginalized identity*. Hence, most of the experimental psychological research has focused on discrimination against historically relatively disadvantaged, marginalized groups such as women (sexism) and ethnic minorities (racism; Schmitt et al., 2014). Nonetheless, in experimental settings also more privileged, non-marginalized groups are frequently included. These studies operationalize discrimination solely as unfair treatment based on non-marginalized identities that lacks the foundation of stigma and power imbalances (e.g., unfair treatment based on academic identities such as specific study majors or men who encounter unfair treatment based on gender in a laboratory setting).

The extensive impact of social discrimination occurs at the individual, institutional, structural, and cultural level. On the individual level, *interpersonal discrimination* describes directly discriminatory interactions between individuals either in their institutional roles (e.g., employer/employee) or as private individuals (Krieger, 2014). Individual discrimination encompasses both overt and explicit unfair treatment based on social identity and more frequent subtle and unconscious forms that are difficult to identify owing to their ambiguous and often unintentional nature (Jones et al., 2016; Williams et al., 2021). *Institutional discrimination* refers to mesolevel discriminatory policies and practices carried out by state or nonstate institutions, for example, criminal justice policy or approaches to education or health

care (Krieger, 2014). *Structural discrimination* refers to mutually reinforcing systems of discrimination in various areas on the mesolevel that reinforce discriminatory beliefs, values, and distribution of resources (Krieger, 2014). In the current literature, the terms institutional and structural discrimination are often used interchangeably and are considered to be closely linked (Reskin, 2012). For example, phenomena such as residential segregation or discrimination through the criminal justice system are influenced by both levels (Williams et al., 2019). Importantly, institutional and structural discrimination are independent of intent and actions of individuals, often remaining imperceptible to perpetrators because they act as agents of a system with discriminatory practices and policies that may predate them (Krieger, 2014). These forms of discrimination can impact health through multiple pathways, such as by limiting access to quality education and employment opportunities, reducing access to resources that enhance health or health behaviors, or increasing the prevalence and cooccurrence of chronic and psychosocial stressors (Williams et al., 2019).

The mental health effects of structural and institutional discrimination and their underlying mechanisms are difficult to research in laboratory contexts using conventional psychological research methods such as experiments. There are approaches from other disciplines that examine the relation of indicators of structural aspects with population measures, such as past structural racism (i.e., historic redlining scores) and current prevalence rates of poor mental and physical health (Lynch et al., 2021). Further studies have examined the relationship between neighborhood deprivation and indicators of health, such as the number of physical activity facilities or the density of tobacco, alcohol, and fast-food outlets (Schneider & Gruber, 2013; Schneider et al., 2015). Yet, the impact of structural factors on individual mental health remains unexplored. The field of psychology is adopting a structural-psychological approach to examine the effects of structural factors on individual outcomes. This approach acknowledges that individuals are not isolated entities but rather embedded within complex webs of societal factors such as social norms, power dynamics, and historical

contexts (Syed & McLean, 2023). Thus, a comprehensive understanding of human experiences requires considering both internal psychological processes and the external societal factors that shape those processes. This approach advocates integrating various research methods – for example, analyzing cultural products like media or historical documents, personal narratives, observing conversations, or evaluating responses to different narratives – to uncover how societal factors are internalized, negotiated, resisted, and even transformed by individuals (Syed & McLean, 2023).

The ideology of the inferiority of certain groups is embedded in several aspects of a given culture, such as values, norms, language, symbols, and unspoken assumptions (Williams et al., 2019). *Cultural prejudice* creates a larger ideological environment that favors both structural/institutional and individual discrimination, leading to widespread stereotypes and attitudes that are consciously or unconsciously adopted and internalized (Williams et al., 2019). The internalization of prejudice influences the mental health of affected individuals through processes such as self-stigmatization, stigma consciousness, and stereotype threat. *Self-stigmatization* refers to the acknowledgment that the negative stereotypes apply to oneself, leading to decreases in self-esteem and self-efficacy (Corrigan & Rao, 2012). *Stigma consciousness* describes the extent to which individuals expect to be stereotyped by others (Piel, 1999), resulting in higher anticipatory stress, vigilance, and rumination (Williams, 2019). A related construct, *stereotype threat* (Steele, 1997), describes the disruptive negative state that arises when a person feels at risk of confirming or being judged or discriminated against on the basis of a negative stereotype (Spencer et al., 2016). In addition to the extensively researched consequences for performance (e.g., Spencer et al., 2016), stereotype threat also affects sense of belonging (Walton & Cohen, 2007) and, in the long term, well-being and mental health through negative interpersonal interactions (Burgess et al., 2010; Veldman et al., 2021) and physiological stress responses (Blascovich et al., 2001; Derks et al., 2011). Importantly, interpersonal discrimination on the individual level, cultural prejudice as

aspects of the broader societal context, and institutional and structural discrimination are mutually interdependent (Lattanner & Hatzenbuehler, 2023; Skinner-Dorkenoo et al., 2021; Williams et al., 2019).

Everyday Discrimination and Microaggressions

Everyday discrimination and *microaggression* are two chronic forms of discrimination that strongly overlap (Essed, 2008; Williams, 2020). Both include covert prejudice and are rooted in cultural prejudice, stigma, and historically determined power differences. The relevant difference between the two concepts is that everyday discrimination focuses on discrete discriminatory experiences and includes subtle and overt discrimination, whereas microaggression exclusively focuses on subtle forms (Williams, 2020). These subtle and chronic forms of daily social discrimination are prevalent in contemporary societies and linked to poor mental health (Schmitt et al., 2014). Despite the conceptual introduction of microaggression in the 1970s (Pierce, 1970, 1974), research on microaggression is relatively recent within the field of psychology. According to a citation analysis in the Social Science Citation Index using the search term "microaggress*," there has been a strong increase in publications and a marked upward trend related to this topic since 2015, with 89% of all articles on the topic published since 2015. The vast majority of this research has focused on ethnoracial microaggressions which may limit the generalizability to other groups. Each stigmatized group has a unique history that shapes aspects of cultural prejudice, the larger ideological environment, and power imbalances that determine the manifestation of microaggressions and discrimination more broadly (Williams, 2020). Despite these differences, there are sufficient similarities in these experiences that go beyond social groupings. Therefore, research on microaggression and discrimination can be adapted and applied to other types of discrimination (Krieger, 2014; Lui & Quezada, 2019).

Sue et al. (2007) provided one of the earliest taxonomies for microaggressions. They defined microaggressions as “brief, everyday exchanges that send denigrating messages to

people of color because they belong to a racial minority group” (p. 273). These exchanges are postulated to contain an implicit hidden hostile or aggressive message. Williams (2020) has built on and extended this definition and describes microaggressions as “deniable acts of racism that reinforce pathological stereotypes and inequitable social norms” (p. 4). Such acts do not require a person’s explicit intent or conscious perception of the target. Sue et al. suggested that microaggression consists of three subgroups: microinsults, microinvalidations, and microassaults. *Microinsults* refer to comments or actions that impart negative or even humiliating messages to victims and “convey rudeness and insensitivity” about individuals’ stigmatized social identities (p. 277). *Microinvalidations* “exclude, negate, or nullify the psychological thoughts, feelings, or experiential reality” of individuals with stigmatized social identities (p. 274). *Microassaults* represent the most blatant form of microaggression and include explicit verbal or nonverbal attacks, including name-calling or avoidant behaviors (Sue et al., 2007). Recent conceptualizations distinguish microassaults from microaggressions due to the former’s more explicit and overt nature of discrimination (e.g., Wong et al., 2014). Notably, in the original taxonomy by Sue et al. (2007), microassaults were described as the only intentionally harmful form, whereas microinsults and microinvalidations were considered to be unintentionally harmful. Importantly, Williams (2020) has proposed a revision of the taxonomy by Sue et al. (2007), contending that all microaggressions are aimed to cause harm and are not limited to intentions on an individual level but can be carried out through institutional and structural means within the larger ideological environment that reinforces power imbalances.

In recent years, there has been a lively debate concerning conceptual and methodological aspects of microaggressions. Lilienfeld (2017) criticized the lack of clarity regarding the operationalization of microaggression and expressed a need for an explicit list of the actions and statements that are said to be covered by the term. Further, he requested more methodological rigor, including assessments of reliability, assessments beyond self-

report, the study of targets of microaggression and the people who express it, tests of a causal effect of microaggressions on mental health, and considerations of the role of negative emotionality as the driver of receiving or perceiving microaggressions. This criticism stimulated not only discussion but also new research to address the issues Lilienfeld raised. Williams (2020) argued that Lilienfeld's definition of microaggression lacked the social context (i.e., cultural prejudice and power imbalances). For example, several studies have shown that the likelihood of engaging in microaggressions across several common contexts was robustly correlated with all five measures of racial prejudice (e.g., Kanter et al., 2017; Mekawi & Todd, 2021). According to Williams, a clear conceptualization is only possible by considering context, because microaggressions are seen not as random behaviors but as expressions of an underlying assumption—racism—that reinforces social inequalities and hierarchies. In addition, Williams claimed that diversity researchers to date have largely agreed on the definition of microaggression.

Concerning methodological criticism on reliability, a recent meta-analysis on microaggression (Lui & Quezada, 2019) reported reliability for 21 scales measuring different domains or forms of microaggression. Of these 21 scales, 14 showed Cronbach's alpha values around .90, that is, excellent reliability, and another five scales values of .80 and higher, which is generally interpreted as good reliability (Tavakol & Dennick, 2011). The findings of this review suggest that Lilienfeld's critique on the reliability of microaggression assessment has largely been addressed in current research. Moreover, Lui and Quezada (2019) showed in their meta-analysis on microaggression and adjustment outcomes that of the 72 studies included, 68 used widely known, reliable self-report scales to assess microaggression. With respect to the critique on using solely self-report measures, Williams (2020) pointed out that many widely accepted constructs in psychology are assessed exclusively with self-report, meaning self-report per se is not a limitation. At least one study assessed both potential targets and people who express microaggressions and showed that both groups have high agreement

about what constitutes a microaggression across numerous categories and scenarios (Michaels et al., 2018). Further current conceptual work on microaggressions has integrated dimensions pertaining to both potential targets (e.g., perceived intentionality and ambiguity) and people who express microaggressions, including factors such as acceptability and motives (e.g., Mekawi & Todd, 2021).

Concerning validity, Williams (2020) pointed to numerous studies that show a relation between the construct “everyday racial discrimination”—that largely overlaps with the construct of microaggression—and (indicators of) mental health. Using a broader range of outcomes, Lui and Quezada (2019) in their review summarized several validity studies of different microaggression measures with adjustment outcomes including stress, negative affect, depression, somatic symptoms, and global psychological symptoms. The effect size, $r = -.20$, was robust across a variety of populations and study designs and comparable to that of other meta-analyses that linked perceived discrimination to health outcomes ($r = -.11$ to $-.20$ in the meta-analyses by Pascoe & Smart Richman, 2009 and $r = -.23$ in the meta-analysis by Schmitt et al., 2014).² Notably, the meta-analytical evidence on microaggression shows correlative, not causal, evidence and further underlines the need for alternative research designs that allow one to draw causal conclusions.

The role of negative emotionality as a driver of receiving or perceiving microaggressions was examined in a longitudinal study (Ong et al., 2013). The researchers found that experiencing microaggressions predicted negative mental health outcomes, even after controlling for trait neuroticism. This is in line with other research assessing trait

² We provide effect sizes from other meta-analyses in the introduction and discussion sections for comparative purposes. Please note that throughout the manuscript, all effect sizes mentioned were (re-)coded such that negative effect sizes indicate poorer adjustment outcomes with higher reported discrimination in correlational studies and poorer adjustment outcomes for the group exposed to the discrimination manipulation compared to the control group in experimental studies. Adjustment outcomes include mental health (e.g., decreased positive affect and increased negative affect), physical health (e.g., decreased physical well-being and increased symptom severity), or work-related outcomes (e.g., decreased work satisfaction and increased work stress).

negative affectivity and mental health that found that although negative affectivity did not explain general ethnic discrimination stress, racial microaggressions explained more than half of the variance in negative affectivity and mental health (Williams et al., 2018). Moreover, West (2019) showed in an experimental study that recalling a microaggression situation reduced positive affect and increased negative affect compared to the recall of a neutral event. These are the first results suggesting that microaggressions could drive negative emotions and not the other way around. To better understand the directionality of this relation, further experimental and longitudinal research designs are warranted.

In sum, the field of microaggression has received much attention and numerous studies on the relevance of microaggressions to mental health and other adjusted outcomes have been published every year. Yet few studies have examined the effect of microaggressions on adjustment outcomes above and beyond the effects of overt discrimination and individual difference factors, and few have researched possible mechanisms explaining the relation between microaggressions and mental health (see Lui & Quezada, 2019, for an overview). Further, research on the causal effects of microaggressions is scarce: Of the 72 study samples included in the meta-analysis by Lui and Quezada (2019), only one used an experimental design. Although previous meta-analyses on microaggressions and adjustment outcomes (including aspects of mental health) showed a significant but small to moderate association, research designs that consider overt forms of discrimination, examine potential pathways, and allow for drawing causal conclusions are needed to further advance the understanding of how microaggressions are related to mental health.

The Impact of Discrimination on Mental Health

Discrimination can negatively impact mental and physical health, whether it is consciously recognized by the affected individual or not (Bailey et al., 2017). Encounters with social discrimination can cause harm in many ways. Discrimination can make it difficult to find a good job or housing or can limit a person's access to adequate health care. Being

treated with less courtesy and respect than other people or being treated as less intelligent or less trustworthy can also cause harm—even if people do not perceive their experiences as discriminatory. There may be additional negative effects on mental health when unfair treatment and disadvantage are subjectively understood as social discrimination. Perceived discrimination threatens one's place and value in society and may have consequences for mental health that go beyond the consequences of the negative treatment itself (Schmitt et al., 2014). In the following, we review contemporary psychological theories that link discrimination to mental health. We consider biological, social, and behavioral factors relevant to that link.

Early Theories on the Effects of Discrimination on Mental Health

The impact of discrimination on well-being and mental health has been the subject of investigation for several decades. Allport's (1954) early studies on the Holocaust formed the basis for research on prejudice and discrimination and described their harmful effects on health and compensatory coping behaviors. In the symbolic interactionist approach, Goffman (1963) emphasized a more social approach (in contrast to the individualistic perspective prevalent today) and described how the self-concept is formed through social interactions and the internalization of the evaluation of others: Because discrimination represents a degradation of one's social group, the self-concept—and in consequence also psychological health—is threatened. With increasing relevance of cognitive processes in psychological research, stigma and discrimination have also been conceptualized as the result of cognitive categorization processes (Jones et al., 1984). More recent experimental research has shown that such cognitive categorization-based treatment, even when intentionally positive, can undermine well-being because it neglects individual preferences and characteristics (Barreto et al., 2010).

Attributional Ambiguity Perspective

Attributional ambiguity is concerned with the uncertainty of whether negative experiences or outcomes should be blamed on the self (e.g., incapacity) or an external cause (e.g., discrimination by others). The first version of the attributional ambiguity theory (Crocker & Major, 1989) made the opposite assumption of the early theories reviewed above. It suggested that when individuals perceive frequent and pervasive discrimination, they are more likely to attribute negative events to discrimination rather than to their own abilities and skills. This attributional pattern was assumed to lead to higher self-esteem and more positive self-directed mental health outcomes. Importantly, this strong assumption –that the attribution to discrimination would lead to improved self-directed mental health outcomes– was not empirically supported and is explicitly refuted in the current attributional ambiguity perspective. The current perspective assumes that attributions of negative events and unfair treatment to discrimination can be self-protective because blame and negative outcomes can, at least in the short-term and for single negative events, be externalized and not attributed to personal failure and deservingness (Barreto & Ellemers, 2015; Major et al., 2002). However, the externalization of blame in response to discrimination is not an automatic default but rather depends on various personal and contextual moderators, such as optimism (Kaiser et al., 2004) or social group identification (McCoy & Major, 2003). Further, the extent to which discrimination is perceived as obvious, unjust, rare, and isolated influences the ease of recognition and externalization of discrimination (Barreto & Ellemers, 2015). In the case of subtle and especially ambiguous forms of discrimination such as microaggressions, externalization is less likely than internalization of negative outcomes. This internalization of negative outcomes makes ambiguous forms of discrimination more harmful to mental health than blatant discrimination (Barreto & Ellemers, 2005a, 2005b; Salomon et al., 2015). Barreto and Ellemers (2015) reported that from an attributional ambiguity perspective, the more discrimination is perceived as pervasive, the greater the threat to just-world beliefs. resulting

in adverse well-being and mental health outcomes (e.g., Kaiser et al., 2006). Nonetheless, external attribution to less pervasive forms of discrimination is not necessarily self-protective (Barreto & Ellemers, 2015). Meta-analytical evidence shows no support for the protective function for mental health when single events are attributed to discrimination compared to personal attribution (Schmitt et al., 2014). Thus, given that empirical research on the attributional ambiguity perspective is inconclusive, it is important to understand the underlying mechanisms that explain when and how discrimination harms mental health. In the following, we present two approaches that describe such potential mechanisms, threat to basic needs and psychosocial stressors.

Discrimination as Needs Threat

Discrimination as needs threat is prevalent in theories of social group identification. These theories generally assume that people possess social group identities to fulfill essential psychological needs. These needs are threatened by discrimination as a form of social rejection with negative effects on mental health. Most theories view people as active defenders of their social identities and propose several strategies to protect or restore social identity. We chronologically review these theories in the following paragraphs.

The *social identity theory* (Tajfel & Turner, 1979) focuses on the need for esteem; that is, the theory posits that people are motivated by the desire to have their social identities valued and accepted in society at large. When social group identification is high, these identities can even be part of the self-concept, and thus when they are threatened, there can be an adverse impact on a person's self-concept and in consequence, mental health. The social identity framework and its extensions understand human beings as active. It suggests strategies including collective action and self-group distancing for dealing with poor group status as the result of negative intergroup behavior such as discrimination.

Extending the social identity theory, the *social identity model of collective action* (van Zomeren et al., 2008) describes confrontation on the individual level and collective action on

the group level as one response to discrimination. Such active responses have social costs and require high self- and group efficacy but improve individual well-being (Cronin et al., 2012; Sohi & Singh, 2015) and can lead to social change (Louis, 2009; Tajfel & Turner, 1979).

Whether confrontation and collective action are employed to deal with discrimination depends on the nature of discrimination: For example, if structural disadvantage is pervasive or discrimination is perceived as legitimized and subtle by affected individuals, active and efficacious ways of dealing with discrimination are less often displayed (Tajfel & Turner, 1979). Pervasive discrimination is less likely to elicit action-oriented emotional responses, such as anger (van Zomeren et al., 2008), and is difficult to change via active response (Sidanius et al., 2004).

A very different strategy to cope with a disadvantaged group status is *self-group distancing* (van Veelen et al., 2020), where individuals try to pass as members of another group and shed their own group identity to avoid potential discrimination threats. Self-group distancing can reduce immediate psychological stress responses to discrimination such as negative emotions (Schmader & Sedikides, 2018) and provide a sense of control (Le Forestier et al., 2020). Still, in the long term, distancing oneself from a stigmatized social ingroup identity can have negative effects on mental health, as it undermines identity-specific motives, such as esteem and belonging and negatively impacts perceived authenticity (Crabtree & Pillow, 2020; Schmader & Sedikides, 2018).

In contrast to self-group distancing, the rejection identification model posits that discrimination leads to increased group identification (Branscombe et al., 1999). According to the *rejection identification model* (Branscombe et al., 1999), group identification can serve as a resource to buffer the negative effects of discrimination that is no longer accessible when one is distanced from one's ingroup (Van Laar et al., 2014). For instance, Fleischmann et al. (2019) demonstrated that ethnic discrimination by the majority population led to reduced identification with the majority but increased ethnic identification. Nonetheless, increased

levels of group identification might also increase vulnerability and even enhance the adverse effects of negative group-based treatment because one's social group identity becomes more relevant to the self (Sellers et al., 2006; Sellers & Shelton, 2003).

Empirical research suggests that identity formation is driven not solely by self-esteem but rather by a complex set of motives (Vignoles et al., 2006). The *multimotive theory of rejection* (Smart Richman & Leary, 2009) depicts discrimination as a threat to the need to belong (Baumeister & Leary, 1995), resulting in numerous adverse mental health effects: Immediate mental health effects include negative affect and lowered self-esteem. In the long-term, people are motivated to restore the need to belong. Possible motivated responses proposed by the multimotive theory of rejection are antisocial responses leading to anger and hostility, withdrawal and avoidance leading to shame, anxiety, and depression, and prosocial responses that are helpful for maintaining relationships but lead to distress and vigilance and thus negative mental health outcomes. These motivated responses are influenced by situational and person-related characteristics such as the perceived pervasiveness, unfairness, or injustice and the agreeableness of the person.

Stress and Coping in the Context of Discrimination and Mental Health

In contrast to the social identity theories reviewed above, current empirical research on the mental health effects of discrimination is primarily based on stress and coping approaches, which have a more individualistic perspective. They are grounded in the theory of social stress (Pearlin, 1999; Pearlin et al., 1981) and the transactional model of stress and coping (Lazarus & Folkman, 1984). Here, discrimination is thought to be a psychosocial stressor that activates biopsychosocial and behavioral stress responses, leading to reduced mental health (Pascoe & Smart Richman, 2009; Williams & Mohammed, 2009). The stress process involves primary appraisals of the demands of a stressor and secondary appraisals evaluating the available resources to cope with it (e.g., Lazarus & Folkman, 1984). Discrimination is deemed particularly harmful to mental health because of its

uncontrollability and unpredictability and its often pervasive and chronic nature, all of which increase the vulnerability to mental disorders (Williams & Mohammed, 2009, 2013).

A stress and coping approach to discrimination was first applied using the biopsychosocial model by Clark and colleagues (1999). Everyday subtle forms of discrimination were assumed to signal a dangerous environment that leads to biopsychosocial stress responses. Following more current *identity threat models* (Berjot & Gillet, 2011; Major & O'Brien, 2005), identity threat results from the appraisal that the demands imposed by a discrimination-relevant stressor are potentially harmful to social identity and the self and exceed available coping resources. Coping strategies can be active and approaching (engagement coping), aimed at changing the stressful situation or one's emotional reaction to it, or passive and avoiding (disengagement coping), aimed at avoiding the stressor or related emotions (Carver & Connor-Smith, 2010). Active engagement coping strategies, such as positive reappraisal or seeking social support, might reduce discrimination's adverse effects on mental health. In contrast, disengagement coping strategies, such as avoidance or denial, could reduce the immediate negative effects of perceived discrimination on mental health in the short term. In the long term, frequent engagement in disengagement coping behaviors could cause negative health problems, such as obesity (e.g., Brown et al., 2021) or increased substance use (e.g., Gerrad et al., 2012), and might lead to a higher stress load on the biological and psychological level (Perez-Tejada et al., 2019). In a meta-analysis, about 80% of the 26 correlative effect sizes showed no influence of coping on the relation between perceived discrimination and mental health (Pascoe & Smart Richman, 2009). Also, another, later meta-analysis found only weak evidence for the buffering effect of engagement coping and the exacerbating effect of disengagement coping (Schmitt et al., 2014). Importantly, these studies are generally correlative; experimental research is scarce. To date it remains largely unclear what type of coping strategy is most effective in buffering the adverse effect of discrimination on mental health.

The *minority stress theory* (Meyer, 2003) posits that individuals with marginalized identities experience not only general stressors, but also unique distal and proximal stigma-related stressors. Distal stressors refer to prejudice-based events, including discrimination and violence; proximal stressors are associated with marginalized identities and vary in terms of their social and personal forms, such as self-stigmatization, stigma consciousness, concealment, and vigilance. These stigma-related stressors create an additional burden and result in additive exposure to stress and might explain group disparities in mental health. As a result, individuals with marginalized identities require more effort to adapt to the additional unique and chronic stigma-related stressors compared to similar individuals without marginalized identities. The minority stress theory underscores the differentiation between personal and group-level resources for coping. Alongside personal resilience and fortitude to endure stressful experiences, group-level factors can serve as protective coping factors for mental health. As per the theory, minority status or group identification not only brings about stress but also confers vital resources, such as group solidarity and cohesiveness, that protect mental health from discrimination-induced stress (Branscombe et al., 1999; Postmes & Branscombe, 2002). According to Meyer (2003), social support from other ingroup members in the face of discrimination, along with reappraisal that validates deviant discriminatory experiences and feelings of minority individuals (Thoits, 2013), are crucial coping resources at the group level.

The *psychological mediation framework* (Hatzenbuehler, 2009) builds on the minority stress theory (Meyer, 2003) but also emphasizes the common vulnerabilities in psychological and social processes that can lead to mental health impairments. Specifically, Hatzenbuehler (2009) reviewed the empirical evidence for affective, social, and cognitive risk factors that contribute to adverse mental health outcomes. Affective factors include coping and emotion regulation processes that can be impaired by chronic life stressors (Kim et al., 2013) and contribute to depression (Berking et al., 2014), anxiety disorders (Cisler et al., 2009), and

internalizing and externalizing mental health outcomes (Aldao et al., 2016). Maladaptive emotion regulation strategies resulting from discrimination-related stressors, especially ambiguous ones, such as rumination (Kaufman et al., 2017; Hatzenbuehler et al., 2009), are associated with depressive and anxiety symptoms and predict the onset and maintenance of depressive and anxiety disorders (McLaughlin et al., 2011). Stigma-related stressors can also alter social processes and might lead to isolation and a lack of social support, increasing vulnerability to internalizing psychopathology (Hatzenbuehler, 2009; Lattanner et al., 2022). Furthermore, discrimination, especially when perceived as pervasive and uncontrollable, can alter cognitive processes such as hopelessness and pessimism as well as deficits in self-mastery and negative self-schemas that in turn can predict internalizing mental health outcomes (Hatzenbuehler, 2009, for a review).

Physiological, Social, and Behavioral Pathways Between Stress Responses, Mental Health, and Discrimination

Exposures to discrimination, like other stressors, can trigger negative emotional states and activate *physiological stress responses* in cardiovascular (e.g., increased blood pressure; Dolezsar et al., 2014), neuroendocrine (e.g., increased cortisol output; Korous et al., 2017), and immune systems (i.e., inflammation; Cuevas et al., 2020), and alterations in stress-related gene expression (Goosby et al., 2018). Notably, everyday experiences of discrimination and microaggressions lead to negative emotions and physiological stress—above and beyond general daily stress—that over time might have long-term effects through brain-regulated allostatic mechanisms (Cheadle et al., 2020). Similarly, repeated exposure to discrimination leads to greater diastolic blood pressure reactivity that is assumed to prepare the body to be more physically reactive in stressful or potentially stressful social situations (Guyll et al., 2001).

One well-researched physiological mechanism is increased inflammation that has been discussed as one major physiological pathway by which discrimination-related and other

stressors can harm health (Cuevas et al., 2020). When inflammation becomes chronic through continuously experienced discrimination, it can cause significant physical and mental health impairments. For example, increased inflammation has been linked to depression (Berk et al., 2013) and cardiovascular disease (Golia et al., 2014). Increased inflammation can also alter brain circuits, resulting in a heightened sensitivity to potential negative social experiences such as rejection and discrimination, resulting in a noxious cycle that consequently might increase the risk of poor mental health (Eisenberger et al., 2017). Social support and higher social integration seem to be able to buffer discriminatory stress and have been linked to lower inflammation (Uchino et al., 2018).

At the same time, these protective social factors can be negatively affected by discrimination. Discrimination hinders access to various types of *social relationships* leading to a loss of social capital and social support (Doyle & Barreto, 2023). This not only reduces stress buffering and coping but also directly diminishes life opportunities and mental health and can even lead to increased mortality risk (Holt-Lunstad et al., 2010; Thoits, 2011). Moreover, stigma itself can shape interpersonal social relationships and can impact various forms of relationship functioning, such as affect and conflict, relationship quality, and support (Doyle & Barreto, 2023). Doyle and Molix (2014) focused on physiological and psychological pathways for the adverse impacts of discrimination on relationship quality and showed that the effect was mediated by increased emotion dysregulation and chronic inflammation. Further psychological pathways may include decreased trust (Zhang et al., 2020), a reduced sense of belonging (Froehlich et al., 2023), or loss of control that can lead to aggression and controlling behavior (Kazmierski et al., 2023; Petsnik & Vorauer, 2023). Furthermore, discrimination can manifest within relationships, for instance in the form of friendly teasing, making discrimination more ambiguous and thus more challenging to cope with (Douglass et al., 2016; Yampolsky et al., 2023). Discrimination's impact on social

relationships is thus complex and multifaceted, necessitating further research and a nuanced understanding of its various effects.

Like other psychosocial stressors, discrimination also affects mental health via the *behavioral pathway*. Pascoe and Smart Richman (2009) showed in their meta-analysis that experienced discrimination is related to less healthy behaviors. A possible mechanism might be institutional discrimination in health care (Cook et al., 2014) or structural environmental factors such as segregation (Schneider & Gruber, 2013; Schneider et al., 2015). Another explanation provided by Pascoe and Smart Richman is decreased availability of self-control resources due to ego depletion produced by stress. The effect of ego depletion on self-control is controversial, however (Friese et al., 2019; Hagger et al., 2016; Job et al., 2010). Further, health behaviors are negatively affected by stress beyond assumptions about ego depletion, self-control, or self-regulatory goals. For example, stress-induced or emotional eating in response to stress is a reason for overconsumption (Jacquier et al., 2012) or can be used as an unhealthy coping strategy (Dallman, 2010). General psychosocial stress longitudinally predicts less leisure-time physical activity (Mouchacca et al., 2013) and impaired sleep (Åkerstedt, 2006). Substance use, or self-medication, is another coping strategy to manage the adverse impact of discrimination. For example, in a 5-year longitudinal study, Gibbons and colleagues (2010) showed that experienced racism led to more externalizing mental health outcomes that in turn predicted increased substance use. Further, efforts to restore the need to belong may also drive heightened substance use (see also the multimotive theory by Smart Richman & Leary, 2009).

Appraisal of Discrimination-Related Stressors and Their Effect on Mental Health

Other potential factors that influence how discrimination is appraised include dimensions of stigma, aspects of discrimination and the social context, and situational and person-related characteristics (Berjot & Gillet, 2011; Major & O'Brien, 2005). These factors may help explain why different types of discrimination, such as racism or sexism, differ in

how strongly they affect mental health. Different stigma dimensions influence appraisal and determine resilience and vulnerability to the adverse effects of discrimination (Crocker et al., 1998), namely, cultural prejudice and the subsequent understanding of marginalized *group status* and the *pervasiveness of discrimination*, and perceived *controllability* and *concealability* of a marginalized identity. Subsequent aspects of discrimination and the social context that influence appraisal include the *legitimacy* and *severity of discrimination*. Further, psychological aspects such as *stigma sensitivity and consciousness* and *person-related demographics* such as age and gender are central to how individuals appraise and cope with discrimination-related stressors. These different factors are described in detail below.

Group Status and Pervasiveness of Discrimination. Based on cultural prejudice, certain groups within a society have a historically relatively disadvantaged and marginalized status. These groups are particularly vulnerable to enduring discrimination based on their actual or presumed marginalized identity, including but not limited to gender identity, age, ethnicity, religion, disability, sexual orientation, educational level, and geographical location (see e.g., United Nations, 2017). A correlative meta-analysis showed stronger associations between discrimination and mental health against marginalized compared to non-marginalized groups, but note that group status showed no effect in experimental studies (Schmitt et al., 2014). Marginalized groups are more likely to experience discrimination as more pervasive compared to non-marginalized groups. This could make discrimination especially harmful to marginalized groups (Schmitt & Branscombe, 2002). Because discrimination is less avoidable when it is pervasive across time and contexts, perceptions of pervasive discrimination should be more likely to be experienced as uncontrollable, as rejection by society at large; consequently, pervasive discrimination is more likely to undermine feelings of control (Verkuyten, 1998) compared to discrimination resulting from an isolated, single event. Also, self-protecting functions of attributions to discrimination as discussed in terms of attributional ambiguity are not feasible in the case of pervasive discrimination (Stroebe et al., 2011). The

meta-analysis by Schmitt et al. (2014) showed that manipulation type was a significant moderator: Studies that used pervasive discrimination manipulations showed a stronger mental health effect than studies that manipulated attributions of a single negative event to discrimination versus to a personal reason.

Controllability and Concealability of Stigma. Higher levels of alleged control over the onset, removal, and maintenance of a marginalized identity make discrimination more harmful to mental health (Schmitt et al., 2014). For instance, the onset, removal, and maintenance of overweight and obesity are perceived to be highly controllable, even though these perceptions do not align with the actual level of controllability associated with these conditions (Puhl & Brownell, 2003). Further, individuals living with HIV or other sexually transmitted infections are often perceived to have high levels of stigma onset controllability but relatively low control over stigma removal (Seacat et al., 2007). When discrimination is seen as legitimate and deserved by the affected individual because the underlying marginalized identity is appraised as controllable, discrimination is likely to be internalized (e.g., Pearl & Lebowitz, 2014). In consequence, self-protective functions of attributional ambiguity are undermined, and discrimination becomes more harmful (Nestler & Egloff, 2013). Moreover, the alleged control over a marginalized identity might instead lead to the aspiration to remove the marginalized identity and self-group distancing rather than develop a protective group identity. For less visible marginalized identities, concealability might even enhance the likelihood of self-group distancing to prevent negative short-term effects in relatively new interpersonal contexts and relationships or severe instances of discrimination (for instance not wearing a headscarf for work interviews or not revealing sexual orientation in a high threat situation; Clair et al., 2005). Nevertheless, the positive functions of a concealed marginalized identity are only short term—in the long term, active suppression can lead to internalization of discrimination and, in turn, to negative mental health and relationship outcomes (Barreto et al., 2006; Quinn et al., 2014). At the same time, concealing

a marginalized identity also reduces opportunities for protective factors such as social support (see Chaudoir et al., 2013, for a narrative review). Meta-analytical evidence suggests a stronger association with negative mental health outcomes for more concealable than less concealable marginalized identities (Schmitt et al., 2014). The cognitive-affective model of psychological effects of concealing a stigma (Pachankis, 2007) emphasizes the role of vigilance and suspiciousness/threat of discovery as potential pathways through which disclosure creates additional stress, leading to affective implications such as anxiety, depression, hostility, guilt, and shame, as well as negative self-evaluative effects such as a negative view of self, decreased self-efficacy, and a lack of group-based self-protective attributions. Pachankis (2007) described social avoidance and isolation and, thus, impaired social functioning as outcomes of concealing a marginalized identity that in turn further exacerbates the negative effects of discrimination on mental health.

Legitimacy and Severity of Discrimination. Discrimination against marginalized identities perceived to be more controllable is deemed as more deserved and legitimate (e.g., weight discrimination), both by the stigmatized individual themselves and the wider society. When discrimination is appraised as legitimate and accepted by the wider society, it occurs more frequently and becomes more pervasive for marginalized individuals. Following social identity theory (Tajfel & Turner, 1979), legitimacy appraisals by the affected individual or perceptions of justifiability of negative group-based treatment are more harmful for well-being as it prevents collective action (Jetten et al., 2011) and can lead to self-stigmatization (Herek, 2007). Moreover, the notion of legitimacy may shed light on the inconsistent findings regarding group identification as both a protective and exacerbating factor in the face of discrimination. Specifically, when discrimination is appraised as legitimate by the affected person, group identification exacerbates the detrimental effects on mental health, whereas group identification has a buffering effect when discrimination is perceived as illegitimate (Hansen & Sassenberg, 2011).

Subtle forms of discrimination are more frequent and chronic, they are considered socially acceptable and more legitimate by affected individuals and broader society compared to more overt forms of discrimination (Salomon et al., 2015). Thus, subtle forms of discrimination might have stronger effects on mental health than overt discrimination. Further, their ambiguous nature makes it more difficult to cope with subtle discrimination stressors, eventually leading to more rumination and a prolonged stress response (Williams et al., 2003). A meta-analysis by Jones and colleagues (2016) found comparable associations for overt and subtle discrimination in the work context with adjustment outcomes, namely, mental health ($r = -.31$ for subtle and $r = -.28$ for overt discrimination), physiological health ($r = -.17$ for subtle and $r = -.16$ for overt discrimination), and work-related outcomes ($r = -.25$ to $-.31$ for subtle and $r = -.22$ to $-.28$ for overt discrimination). Of note, these findings are based on a very small number of effect sizes and are limited to the work environment. A more recent meta-analysis showed a comparable effect size for the association of microaggressions as one form of subtle discrimination with mental health ($r = -.20$, Lui & Quezada, 2019). Importantly, both effect sizes for subtle discrimination are comparable to meta-analytical estimates of the association of perceived discrimination with general mental health ($r = -.20$ in Pascoe & Smart Richman, 2009, and $r = -.23$ in Schmitt et al., 2014). Following the affective forecasting theory (Wilson & Gilbert, 2003), it has been suggested that the anticipated adverse effects of overt and blatant discrimination are likely overestimated by individuals, whereas the anticipated effects of subtle and less severe discrimination are likely underestimated compared to the actual effects (Bosson et al., 2010). This discrepancy in forecasting and actual experience of discrimination might further intensify the negative effects of subtle and less severe discrimination because targets of such discrimination are less prepared for counteraction, such as effective coping strategies.

Meta-analytical synthesis of evidence requires categorization of the factors influencing appraisal on the study level because of limited information being available in

primary studies on how individuals subjectively perceive the different aspects of stigma and discrimination (e.g., Schmitt et al., 2014). This approach inevitably results in a high level of confounding between the factors and types of discrimination. Since the different types of discrimination vary across multiple dimensions of stigma and discrimination, the analyses of differential effects from discrimination types are exploratory and aim to test the generalizability of the mental health effect. Many reviews and meta-analyses focused exclusively on the relation between ethnic discrimination/racism and health (e.g., Carter et al., 2019; Paradies et al., 2015), but only two meta-analyses examined research on different types of discrimination. These either did not differentiate the effects for the different discrimination types (Pascoe & Smart Richman, 2009) or found mixed results (Schmitt et al., 2014). Specifically, Schmitt et al. (2014) showed that the correlative effect sizes for studies of racism ($r = -.21$) and sexism ($r = -.18$)—discrimination types that were also coded as less concealable and controllable—were smaller than those for studies of more concealable and controllable types of discrimination based on physical disability ($r = -.41$), HIV status ($r = -.33$), mental illness ($r = -.31$), sexual orientation ($r = -.28$), or weight ($r = -.28$). Due to a lack of primary studies, Schmitt et al. (2014) investigated causal effect sizes only for racism ($d = -.11$ for well-being; $-.13$ for self-directed affect), sexism ($d = -.04$ for well-being; $-.02$ for self-directed affect), and academic identity ($d = -.12$ for well-being; $-.11$ for self-directed affect) and found no significant differences between these types of discrimination. These findings are based on a small number of effect sizes and the correlational results indicate that discrimination might have different consequences depending on the type of discrimination. Hence, such differences may also be found in experimental data.

Stigma Sensitivity and Consciousness. According to identity threat models (Berjot & Gillet, 2011; Major & O'Brien, 2005), stigma sensitivity and stigma consciousness influence the appraisals of discrimination-related stressors. Stigma sensitivity describes the ability to detect discrimination in the environment. For example, some individuals may be more alert

toward rejection and therefore more sensitive to environmental cues that could indicate discrimination (Mendoza-Denton et al., 2002). Further, individuals differ in their level of stigma consciousness, that is, their expectations regarding how they will be judged and treated on the basis of negative stereotypes associated with their social identity (Pinel, 1999). Stigma sensitivity and stigma consciousness result in greater vigilance toward stigma-related threats and heightened likelihood of appraising stigma-relevant situations as threatening (Major & O'Brien, 2005). Because rejection sensitivity and stigma consciousness represent factors on the person level and are thus within-study variables, they cannot be adequately tested quantitatively in our meta-analytic synthesis. In this study, we focus on gender and age as important factors influencing the appraisal of and coping with discrimination-related stressors.

Demographics: Gender and Age. In prior research, discrimination was negatively associated with mental health for both women and men. Following the reasoning of Schmitt et al. (2014), discrimination may be more harmful to women than to men because most women are disadvantaged and marginalized in several areas of society (and generally in more areas than men) and thus might have fewer coping resources compared to men. Further, women are more likely to ruminate than men (see the meta-analysis by Johnson & Whisman, 2013). Rumination in turn is one of the key mechanisms assumed to reinforce the negative effects of subtle discrimination on mental health (see Sarno et al., 2020, for a longitudinal study). Importantly, nonbinary and transgender identities challenge the traditional gender binarity, cultural norms, and expectations to a greater degree than binary gender identities and thus might even show more pervasive and severe intersectional effects of discrimination on mental health (e.g., Harrison et al., 2012). Nonetheless, empirical data regarding the influence of gender on the consequences of discrimination are currently still focused on a binary conception of gender, and findings from such studies show mixed and inconclusive results (Paradies et al., 2015). Most correlational meta-analyses found no moderating effect of gender

(e.g., Pascoe & Smart Richman, 2009), or a minimal descriptive difference in effect (Carter et al., 2019; $r_{women} = -.21$, $r_{men} = -.20$). Furthermore, Schmitt et al. (2014) showed that discrimination was more strongly linked to mental health among marginalized groups ($r = -.24$) than among non-marginalized groups ($r = -.10$), with women belonging to more marginalized groups compared to men. Cohen et al. (2019) argued that women might be more sensitive to interpersonal stressful life events than men and the experience of discrimination might be considered such a stressful life event.

Although much of the early research on discrimination and health focused on adult populations, there is increasing attention to the effect of discrimination on mental health outcomes for children and adolescents. Two meta-analyses found that the negative relationship between perceived discrimination and psychological distress was larger for children than for adults ($r = -.25$ and $-.18$, respectively, in Lee & Ahn, 2013 and $r = -.32$ and $-.28$ in the correlative meta-analysis by Schmitt et al., 2014; age could not be tested as a moderator in the experimental meta-analysis by Schmitt et al. owing to a lack of data). Young people may be particularly emotionally vulnerable to discrimination because their self-identity and self-esteem are still developing (Marks et al., 2015), they show a heightened emphasis on social feedback and social influence (Douglass et al., 2016), and they are particularly vulnerable to effects of stress (Larson et al., 2002). In addition, with increasing age, people may have more experience dealing with discrimination experiences and therefore may have developed more effective coping mechanisms (Kazmierski et al., 2023).

Importantly, when assessing discrimination, intersectionality should be considered because focusing on only one marginalized identity might underestimate the mental health effect of discrimination (Lewis & Van Dyke, 2018): Social identities are mutually related (Shields, 2008), which shapes and influences social positions and power relations (Hankivksy & Christoffersen, 2008). To adequately consider intersectionality, contextual examinations are necessary, as the goal is not simply to sum up social categories but to examine the

convergence of experiences (Hankivsky & Christoffersen, 2008). Despite initial efforts to make intersectionality quantitatively measurable, such as the framework for developing measures of intersectional microaggressions by Singh et al. (2021), research on intersectional inequalities in mental health, particularly experimental research, is limited in both volume and methodological standardization (see, for example, the scoping review by Fagrell Trygg et al., 2021). Nevertheless, it is important that studies start to take intersectional perspectives, for instance, by examining the interactions of prominently assessed dimensions, such as gender and age, which is an important starting point.

Different Aspects of Mental Health

Mental health is a complex construct that has been defined as a state of mental well-being that enables people to cope with the stresses of life, to realize their abilities, to learn well and work well, and to contribute to their communities. Mental health is an integral component of health and well-being and is more than the absence of mental disorder (World Health Organization [WHO], 2022, p. 8).

There are good theoretical and empirical reasons for predicting that discrimination harms mental health in general, which means it affects all forms of indicators of mental health and worsens symptoms of mental disorders as well as well-being outcomes (Pascoe & Smart Richman, 2009; Williams et al., 2003). Specific aspects of mental health might be differentially affected, including well-being-related positive mental health (e.g., positive affect, well-being, life satisfaction) and psychological-distress-related negative mental health (e.g., anxiety, psychological distress, negative affect), as well as other-directed (i.e., externalizing mental health outcomes including feelings of anger and hostility) and self-directed mental health outcomes (i.e. internalizing emotions such as self-worth, self-esteem, depressed affect, shame, guilt, self-directed anger).

Reviews of correlational evidence showed stronger adverse associations of discrimination with negative distress-related mental health outcomes than with those related to positive well-being ($r = -.23$ and $r = -.13$, respectively, in Paradies et al., 2015, and $r = -.26$ and $r = -.16$ in Schmitt et al., 2014). Other-directed mental health outcomes are important to facilitate confrontation and collective action but are less likely when discrimination is perceived as legitimate and pervasive by affected individuals (cf. social identity theory of collective action; van Zomeren et al., 2008). The effect of discrimination on self-directed outcomes possibly depends on attribution processes: The attributional ambiguity hypothesis (Crocker & Major, 1989) postulates that individuals who perceive themselves as stigmatized tend not to attribute adverse events and negative feedback to their self and personal deservingness but rather to externalize it to discrimination. Thus, self-directed affect might be particularly protected by externalizing blame to discrimination, away from the self. Importantly, previous research emphasized the strong dependence of attribution ambiguity on personal and contextual factors, underlining that the effect of attribution might not be inherently self-protective (Major et al., 2002). This is in line with results of the meta-analysis by Schmitt et al. (2014), which did not find differences between self-directed outcomes and general well-being in the face of discrimination.

Most theories on the effects of discrimination on mental health do not make precise assumptions for specific mental health outcomes and focus more on the long-term effects on mental health. The *multimotive theory of rejection* (Smart Richman & Leary, 2009) describes that immediate global responses to social rejection and discrimination are negative affect and lowered state self-esteem, an assumption in line with the empirical findings of the reviews by Schmitt et al. (2014) and Paradies et al. (2015) but contradicting the attributional ambiguity perspective that assumes protection of self-esteem. The longer term effects of discrimination are a motivation to restore the sense of belonging and can be other-directed or self-directed and can influence both positive well-being-related and negative distress-related outcomes

(Smart Richman & Leary, 2009). In sum, whether discrimination has different effects on the different categories of mental health outcomes has yet to be determined. Further, subgroup analyses are needed to test the generalizability of discrimination effects.

Experimental Research on the Effects of Discrimination on Mental Health

Experimental Paradigms to Induce Feelings of Discrimination

To investigate how individual-level discrimination influences mental health, several experimental research designs have been applied. Generally, the different experimental paradigms are focused on different types of discrimination (e.g., sexism or racism) and are placed in different social contexts (e.g., education, health care) with different levels of pervasiveness (i.e., a rare and isolated single event such as a discrimination-related encounter in an experimental situation vs. information on pervasive discrimination of the ingroup over contexts and times).

Specifically, the experimental research paradigms used to induce or elicit discrimination can be differentiated as follows (see Table 1.1 for a description of commonly used experimental paradigms). Paradigms that are related to experiencing discrimination in real-life include the *direct experience of discrimination* in which the discriminating event is experimentally induced (e.g., participants receive negative feedback or unfair treatment from an experimenter that can be attributed to discrimination) or in which participants are exposed to a *stereotype threat* (e.g., feeling at risk of confirming negative stereotypes about their ingroup such as gender or ethnicity) followed by having to *perform a task*. Paradigms that make experienced discrimination about one's group salient include *autobiographical recalls*, in which participants are asked to remember a situation in which they felt discriminated against, and *making general stereotypes about one's group salient*, which is usually enacted by asking participants to write or think about general stereotypes that (specific) others have expressed about their group. A third group of experimental research paradigms uses more vicarious discrimination experiences. This includes *imagination* of a situation in which a

person of their ingroup is discriminated against or they were in the position of a person of the ingroup experiencing discrimination; *reading a text, viewing images/pictures, watching a video clip, or hearing an audio clip* about a situation that is discriminatory against their ingroup or contains information about pervasive discrimination against their ingroup.

Vicarious discrimination experiences do not include bystander effects in which a participant witnesses discrimination against an outgroup identity – such paradigms were excluded from the current meta-analysis. Yet, bystander effects in which a participant witnesses discrimination against an ingroup identity were included. Future research might also rely on additional paradigms, such as virtual reality, to induce discrimination in experimentally controlled but even more externally valid ways (e.g., Lui et al., 2023).

Measuring Experimentally Induced Discrimination on Mental Health: Strengths and Limitations

The most important strength of experimental paradigms to induce discrimination is that they allow drawing causal conclusions because all potential confounding factors are controlled or balanced because of the experimental setup (i.e., high internal validity). Further, using established research paradigms across different studies allows comparing and synthesizing findings to reach potentially more reliable or more general conclusions than would be possible based on a single study alone. In addition, experimental studies offer an opportunity to identify potential moderators that contribute to resilience or vulnerability. The fundamental aim of investigating how discrimination influences mental health—as with any social determinant of health—is not only to demonstrate the extent of its harmful effects, but to comprehend the factors that make individuals particularly vulnerable or resilient (Krieger, 2014).

At the same time, controlled laboratory experiments are generally limited in their external validity. In the case of the experimental manipulations of discrimination and their effects on mental health reviewed here, a specific limitation is the one-time artificial induction

of discrimination in a laboratory setting. Even when this induction is manipulated as being pervasive, the mental health effects likely do not fully reflect the extent of chronic daily and more blatant discrimination encountered in real life. Experimental settings only allow the measurement of more acute and immediate mental health outcomes, that is, states such as affect or single symptoms of mental disorders, such as depressive mood or fear. Long-term effects on general mental health or specific mental disorders cannot be investigated as outcomes in such a design, as a diagnosis of mental disorders is characterized by the presence of a variety of symptoms over a longer time period (e.g., for major depression at least 2 weeks on most days; American Psychiatric Association, 2022). Acute mental health outcomes, however, are an important aspect of general mental health. For example, increased negative affect is one of the cardinal symptoms of depression and is also observable in experimental designs with populations at risk for major depression (e.g., Mata et al., 2013). Also, people at increased risk for depression show similar cognitive and emotional patterns in experimental settings to those of people who have been diagnosed with depression (see Gotlib et al., 2014, for a review).

According to the life course approach (Reskin, 2012) and the weathering hypothesis (Geronimus et al., 2006), discrimination has a cumulative effect on mental health. This is particularly important as certain forms of discrimination can occur from a very young age (e.g., Waxman, 2021, showed that racial awareness starts in infancy), can even have an adverse health effect when experienced before birth (e.g., Scholaske et al., 2019, showed that perceived discrimination is associated with preterm birth), and may also be transmitted intergenerationally (Lugo-Candelas et al., 2021). Although the life course approach helps explain how discrimination develops and interacts at various stages of life, this perspective cannot be incorporated in experimental studies (yet). Additionally, stigma and discrimination are fundamental causes of health inequalities (Hatzenbuehler et al., 2013; Phelan & Link, 2015) and have an impact on the complex patterns of various life opportunities and outcomes.

Therefore, when examining the mental health effects of discrimination in experimental settings, it is crucial to consider that these effects are likely underestimated, as it is difficult to map the complex patterns of outcomes in laboratory settings. Furthermore, as described above, taking an intersectionality perspective in experimental research is difficult; yet focusing solely on one stigmatized identity cannot fully capture the full impact of discrimination on mental health.

Ethical Considerations

Conducting experimental research on discrimination is a challenging and delicate matter that raises ethical concerns, owing to the induction of intense negative thoughts and emotional pain in participants. The scientific basis of such studies must be strong, and researchers have a responsibility to minimize potential risks of psychological harm (Hegtvedt, 2014). Experiencing discrimination can be compared to enduring physical pain. Therefore, the amount and intensity of pain caused by discrimination should be comparable to a level of physical pain that researchers deem acceptable in research. This includes that the extent of harm caused by a study should not exceed that caused by negative feelings experienced in daily life and that emotional distress should be temporary and not result in lasting harm to participants (Fiske & Hauser, 2014; Hegtvedt, 2014). Using established experimental paradigms to induce discrimination can help in adhering to these standards, because their effects on indicators of mental health are known and have been evaluated as acceptable. In contrast, asking participants to recall personal situations in which they felt discriminated against bears the risk of (in some participants) evoking pain that is stronger than would be deemed acceptable, and researchers must include measures to help participants cope with this pain and reach their emotional/mental state they had before taking part in the experiment. Other ways to reduce the extent of potential harm include providing participants with the opportunity to opt out of the study and informing them of the purpose of the study as well as potential risks before obtaining informed consent (Hegtvedt, 2014; Office for Human

Research Protections, 2022). In discrimination research, the lack of informed consent raises significant ethical concerns, as researchers often use deception to enhance experimental control and experimental realism (e.g., Adams et al., 2006; Major et al., 2003; Rodriguez et al., 2016). Deception should be avoided unless it is essential and justified by a significant purpose, as it can impair participants' autonomy, self-determination, and decision-making abilities through the lack of full disclosure (Kelman, 1967). Moreover, deception can negatively affect public trust in scientific research (Hertwig & Ortmann, 2008). If deception cannot be avoided, the harm caused by deception needs to be minimized by debriefing participants about the true purpose of the study and the nature of the deception. This process should include “dehoaxing,” where researchers provide information about the study's true purpose, and desensitizing, which aims to remove any emotional harm caused by the study and restore participants' positive well-being (Hegtvedt, 2014). Experimental research on the effects of discrimination on mental health needs to use paradigms that adhere to strict ethical standards. If new paradigms are used, their effects on indicators of mental health, such as affect, or threat to needs, such as control or belonging, need to be closely monitored, counteracted if necessary, and always critically evaluated.

Table 1.1*Possible Taxonomy of Research Paradigms*

Name of research paradigm	Description	Example (studies)
Direct experience paradigms		
Experiencing an event	Participants experience a situation in which they or their ingroup are discriminated against	<ul style="list-style-type: none"> - Participants are in a room with two men disparaging a female colleague (who is out of the room) for refusing a dating request (Cunningham et al., 2012) - Participants receive sexist feedback regarding their score on a standardized test (i.e., remote associates test by Mendnick, 1968; Fisher, 2020) - Participants wear a “fat suit” (Rodriguez et al., 2016) - Participants receive social rejection feedback from a different-race evaluator (Mendes et al., 2008)
Task performance after induction of stereotype threat	Stereotype threat is induced and then participants perform a test/task	<ul style="list-style-type: none"> - Participants are asked to speak in front of a camera for a few minutes after reading a supposedly scientific abstract stating that women have more problems than men managing their anxiety (Désert et al., 2013) - Participants record their gender before they complete questionnaires about evaluations of a local automotive repair service (Lee et al., 2011) - Participants are asked questions about ethnicity immediately preceding a verbal ability test (Baysu & Phalet, 2019)
Salience induction paradigms		
Autobiographical recall	Participants remember a situation in which they felt discriminated against verbally or in writing	<ul style="list-style-type: none"> - Participants are asked to tell the instructor of a stressful event in their life for which they feel as though race played a part in the event (Arriola et al., 2021) - Participants are asked to recall and write at least three hundred words in 15 min. about a situation when they felt they were discriminated against (Stepanova et al., 2019)
Make general stereotypes about one’s group salient	Participants interact with materials that make general stereotypes about their social groups salient	<ul style="list-style-type: none"> - Participants are asked to write, from the perspective of a patient, how many negative impressions they think doctors have about their lifestyle, academic ability, personality, and so on. They are asked to describe these impressions with as many adjectives as possible (He et al., 2020) - Participants are asked to think about the negative impressions of women that a man might hold in terms of lifestyle, learning, and character and to try to write down some adjectives to describe them (Ma et al., 2022) - Participants are instructed to reflect on the negative impressions that native White British people hold of ethnic minorities in this society (Owuamalam & Zagefka, 2014)

(continued on the next page)

Name of research paradigm	Description	Example (studies)
Vicarious experience paradigms		
Imagination	Participants imagine a situation in which they feel discriminated against	<ul style="list-style-type: none"> - Participants are asked to imagine being in the position of a female student presenting a paper in class and receiving a bad grade because of her gender (Hansen & Sassenberg, 2006) - Participants imagine they are job applicants and are to complete a performance test as a basis for the hiring decision; statements are added reminding them about the common beliefs that in a workplace, women are easily disturbed by environmental factors because they are weaker than men and tend to exaggerate the difficulties they face and want to gain power over men (Eniç & Tosun, 2021) - Participants read a social interaction vignette in which a female is shopping at a mall and experiences weight-related teasing by two female peers (Aubie & Jarry, 2009)
Reading text	Participants read a text about discriminatory content or single event	<ul style="list-style-type: none"> - Participants read negative statements about immigration (Chavez et al., 2019) - Participants read anti-Asian tweets and retweets (Lee-Won et al., 2017)
Viewing images/pictures	Participants view an image that is discriminatory	<ul style="list-style-type: none"> - Participants view a negative image about immigration (Chavez et al., 2019) - Participants are exposed to three political poster ads that explicitly portray Muslims in a negative and stereotypical way (Schmuck et al., 2017)
Watching video clip	Participants view a video clip that includes information about discrimination or describes discrimination-relevant situations	<ul style="list-style-type: none"> - Participants view a video clip that presents a diverse range of minority stress domains (e.g., family rejection, legal inequality, antigay advertisement; Van Dyk et al., 2021) - Participants view a short film about a negative event linked to depression in a stigmatizing way, that is, a pilot's clinical diagnosis of depression as a main reason for an incident; the film calls for more transparency and access to employees' medical records (Goepfert et al., 2019)
Hearing audio clip	Participants hear an audio clip with discrimination-relevant information	<ul style="list-style-type: none"> - Participants hear an audio clip read by confederates that includes indirect discrimination (Huyn et al., 2017)

Note. Stereotype threat before a test or task can be induced via recording group identity before the task, diagnosticity of the test (i.e., test result is diagnostic of ability and thus fulfills the stereotypes about intellectual ability, leading to stereotype threat; Steele & Aronson, 1995), or reading a text or instructions on differences between groups or worse outcomes in the ingroup. General stereotypes can be made salient using various specific procedures such as reading, writing, viewing images or video clips, or doing a quiz or task that includes stereotypical information. Some studies, such as Chavez et al. (2019), employ multiple research paradigms in combination to manipulate discrimination.

Study Rationale

Several systematic reviews and meta-analyses (e.g., Pascoe & Smart Richman, 2009, Paradies et al., 2015; Schmitt et al., 2014; Williams et al., 2019) have shown an association between perceived discrimination and a wide range of mental health outcomes. To our knowledge, only Schmitt et al. (2014) have meta-analytically quantified the causal overall effect of experimentally induced discrimination on mental health. Cross-sectional and longitudinal data might provide evidence consistent with the assumption that perceived discrimination negatively affects mental health, but self-reported effects of perceived discrimination are confounded with actual negative consequences of discrimination. Therefore, it is not possible to tell how much of the relationship reflects the effect of subjective perceptions of discrimination and how much reflects the effect of existing discriminatory treatment. Even though many correlational and longitudinal studies controlled for potential confounders such as socioeconomic status or education level, a direct causal pathway between discrimination and mental health needs to be examined using experimental paradigms.

By randomly allocating participants to experimental (i.e., manipulated perception of discrimination) or control conditions and keeping life circumstances and prior experiences constant across conditions, experimental studies can provide evidence of a direct causal effect of social discrimination on mental health. The most recent meta-analysis providing an overview of the experimental effect of discrimination on mental health was conducted by Schmitt et al. (2014) and found no overall effect of experimentally induced discrimination on psychological well-being. Schmitt et al. (2014) did not find a mental health effect in studies comparing attributions of a specific single event to discrimination compared to attributing it to personal characteristics. However, they did find a small, significantly negative effect on psychological well-being for studies that manipulated pervasive perceptions of discrimination against the ingroup (i.e., frequency of discrimination across time and contexts; $d = -.25$ for

well-being, $d = -.21$ for self-directed affect). Nevertheless, the meta-analysis by Schmitt et al. (2014) focused on a limited number of available data sets and aggregated effect sizes on a sample level. Owing to a lack of primary studies (included up to the year 2012), several potential moderators could not be investigated. To address these issues in the current meta-analysis of experimental studies, we updated and extended the work of Schmitt et al. (2014), searching a broader spectrum of relevant databases and including more experimental effect sizes up to September 2022. Moreover, we analyzed all available effect sizes without aggregation using multilevel meta-analytic techniques (Assink & Wibbelink, 2016), and included potential moderators of the effect of social discrimination on mental health. The exploration of possible moderators can identify protective and risk factors regarding the effect of discrimination on mental health that are not yet sufficiently understood (Paradies et al., 2015). Furthermore, to advance future research on social discrimination, this meta-analysis expands the scope by including various types of single-event studies (in contrast to Schmitt et al., 2014, who focused on attributional ambiguity and on comparisons of attributions to discrimination vs. to personal characteristics) and provides an overview of experimental manipulation types and research paradigms.

In sum, in this meta-analysis we tested the overall effect of discrimination on mental health in a broad variety of experimental settings and explored whether the mental health effect of discrimination varies for different discrimination types, manipulation types and pervasiveness of discrimination, or utilized research paradigms. We further tested whether the effect is moderated by characteristics of samples included, namely, group status (i.e., whether participants possess marginalized vs. non-marginalized identities related to the manipulated discrimination type, such as identifying as female vs. male when discrimination type is sexism), age, and gender of participants, and whether specific aspects of mental health are particularly affected by discrimination.

Hypotheses and Exploratory Analyses

Hypotheses

Given the research reviewed above, we proposed the following hypothesis:

1. Discrimination has a negative effect on mental health.

In addition, we aimed to identify potential sources of variation in effects. We hypothesized that the following factors moderate the effect of discrimination on mental health:

2. Manipulation type: The effect of discrimination on mental health is stronger for pervasive discrimination than for single-event discrimination.

3. Group status: The effect of discrimination on mental health is stronger in marginalized identities compared to non-marginalized identities.³

4. Gender: The effect of discrimination on mental health is stronger for individuals who identify as women than those who identify as men.

5. Age: The effect of discrimination on mental health is stronger for younger than for older individuals.

Exploratory Analyses

The existing literature has yet to provide a clear understanding of the potential variations in the mental health effects of different types of discrimination and potential differences in the impact of discrimination on various mental health outcomes. Further, an exploration of experimental research is needed related to manipulation types and research paradigms, as well as samples with different group status. To explore the generalizability of the effect of discrimination across various forms of discrimination and their experimental

³ This hypothesis was added during the revision process and was not preregistered as the preregistration was focused solely on discrimination against marginalized identities and excluded discrimination operationalized as unfair treatment based on non-marginalized identities.

manipulations, samples, and mental health outcomes, we conducted separate meta-analyses to answer the following exploratory research questions:

1. What are the differential effects of specific single-event and pervasive manipulation types of discrimination on mental health?
2. What are the differential mental health effects of discrimination in different research paradigms, namely direct experience, salience induction, and vicarious experience?
3. What are the differential mental health effects of discrimination against marginalized and non-marginalized identities?
4. Do different types of discrimination, namely, sexism, racism, heterosexism, body- and status-related discrimination, differ in the strength of their effect on mental health?
5. What are the differential effects of discrimination on different types of mental health outcomes, namely well-being-related, distress-related, self-directed, and other-directed mental health outcomes?

Control Variables

Although experimental studies are configured to limit the effects of potential confounders and to standardize many aspects of the environment (geographical region and publication year), the characteristics of the study (methodological quality) and sample (education level), these factors may still have an influence on a meta level. To ensure that other factors such as cultural and economic contexts or changes in the research landscape over time did not confound the effect of discrimination on mental health and potential moderator effects, we included the publication year and the geographical location (i.e., region) as control variables. This is not only standard practice in meta-analytic research (Li et al., 2022) but also important for the interpretation of the findings, because levels of discrimination change over time and country (cf. Quillian & Lee, 2023). We also controlled for methodological study quality. This allowed us to include heterogeneous primary studies in the analyses and increases confidence in the findings and conclusions (Johnson et al., 2015; Valentine &

Cooper, 2008). In addition, the education level of participants was included as a control variable because a higher education level is associated with enhanced stress-coping ability (Elo, 2009) that may buffer the adverse effect of discrimination on mental health and lead to an underestimation of the effect. Further, individuals with higher levels of education may have different experiences of discrimination and may be more likely to experience discrimination in certain contexts such as the workplace, whereas individuals with lower levels of education may experience discrimination in other contexts such as access to health care. Thus, education level has an impact on how and when discrimination is pervasive and in what contexts group status is disadvantaged.

Method

Transparency and Openness

The reporting of this meta-analysis is in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher et al., 2015). To minimize the risk of bias, we developed a research protocol and preregistered the meta-analysis as part of an Open Science project before data extraction and analysis. The preregistration, meta-analytic analysis code, and extracted data are available at <https://osf.io/5fqa2/>. Please note the following deviations of this meta-analysis from the preregistration: During the revision process, Hypothesis 3—group status as moderator of the mental health effect of discrimination—was added. This hypothesis was not part of the preregistration because the preregistration was focused solely on discrimination against marginalized identities excluding discrimination operationalized as unfair treatment based on non-marginalized identities. Additionally, the preregistered exploratory analyses on coping strategies and ethnicity could not be conducted due to insufficient variability between samples. To enhance the stringency and clarity of our analyses, these exploratory analyses were excluded from the manuscript. Furthermore, the preregistered *p*-curve analysis could not be carried out because *p*-curve estimates are not robust in the presence of substantial

heterogeneity as found in this meta-analysis and might produce biased results (Cooper et al., 2019). To date, there is yet no alternative selection model in the case of substantial between-study heterogeneity (see review by Rodgers & Pustejovsky, 2021).

Inclusion and Exclusion Criteria

To be included in the meta-analysis, studies had to have an experimental design (i.e., randomized controlled trials with experimental and control groups) with a manipulation of discrimination, report quantitative statistics or descriptions of the effect of discrimination using at least one indicator of mental health, and be written in English or German. The manipulation of discrimination was broadly defined in this study to include all forms of negative or unfair treatment, social rejection or exclusion experiences, and stereotype threat manipulations based on social identity and group membership. All neutral and stressful control conditions were included, whereas control conditions in favor of the ingroup were excluded, because effect sizes could represent effects of discrimination in favor of the ingroup that was not relevant to the investigation. Further, only effects of discrimination targeting the participants' self or social ingroups were included; effects of experiencing situations in which discrimination against individuals or social groups was based on social outgroup membership (i.e., perspective of a bystander) were excluded. This decision was guided by methodological considerations aimed at maintaining consistency and enhancing comparability with other included effects. Moreover, this choice aligns the theoretically expected pathways underlying the effects of discrimination on mental health: Although observing discrimination against individuals based on social outgroup identities does indeed carry the potential to act as a psychosocial stressor and negatively influence mental health, such experiences and their outcomes differ inherently from perceived or observed discrimination threatening one's own social identity as it threatens one's self-concept and place and value in society which goes beyond the consequences of the negative treatment itself (Schmitt et al., 2014).

Mental health was defined as a broad and multidimensional construct that includes a range of different indicators (WHO, 2022). Given the focus on experimental manipulations of discrimination, acute mental health indicators were more likely to be observed than chronic mental health conditions and disorders (which are characterized by a longer time frame of symptoms). Hence, acute indicators of mental health such as affect or specific types of anxiety (e.g., test or intergroup anxiety) were included. On the basis of described theoretical considerations and previous meta-analyses (e.g., Schmitt et al., 2014), mental health outcomes were categorized into well-being-related (i.e., well-being, life satisfaction, positive affect), distress-related (i.e., psychological distress, anxiety, negative affect), self-directed (i.e., self-esteem, depressed affect, other internally directed emotions such as shame and guilt), and other-directed (i.e., anger, hostility) outcomes. Self-reported and implicit measures were included. Observer-reported ratings of mental health indicators were excluded for consistency reasons. This resulted in the removal of three effect sizes from one manuscript (Désert et al., 2013), wherein assessors had rated participants' anxiety levels during a speech task. To account for variability between the broad variety of mental health outcome measures, methodological quality of assessment was considered in the analyses. Further, information on the type of outcome measure (i.e., acute vs. chronic measure of mental health) and the time elapsed between discrimination manipulations and mental health assessments were extracted from primary studies and coded.

Studies were excluded if they reported an unsuccessful manipulation of discrimination (i.e., nonsignificant manipulation check) or the reported statistical information was not sufficient to compute an effect size and the missing data could not be obtained from the authors. Published and unpublished manuscripts were considered without any restrictions on the publication year, participants, setting, or geographical location.

Search Strategy and Study Selection

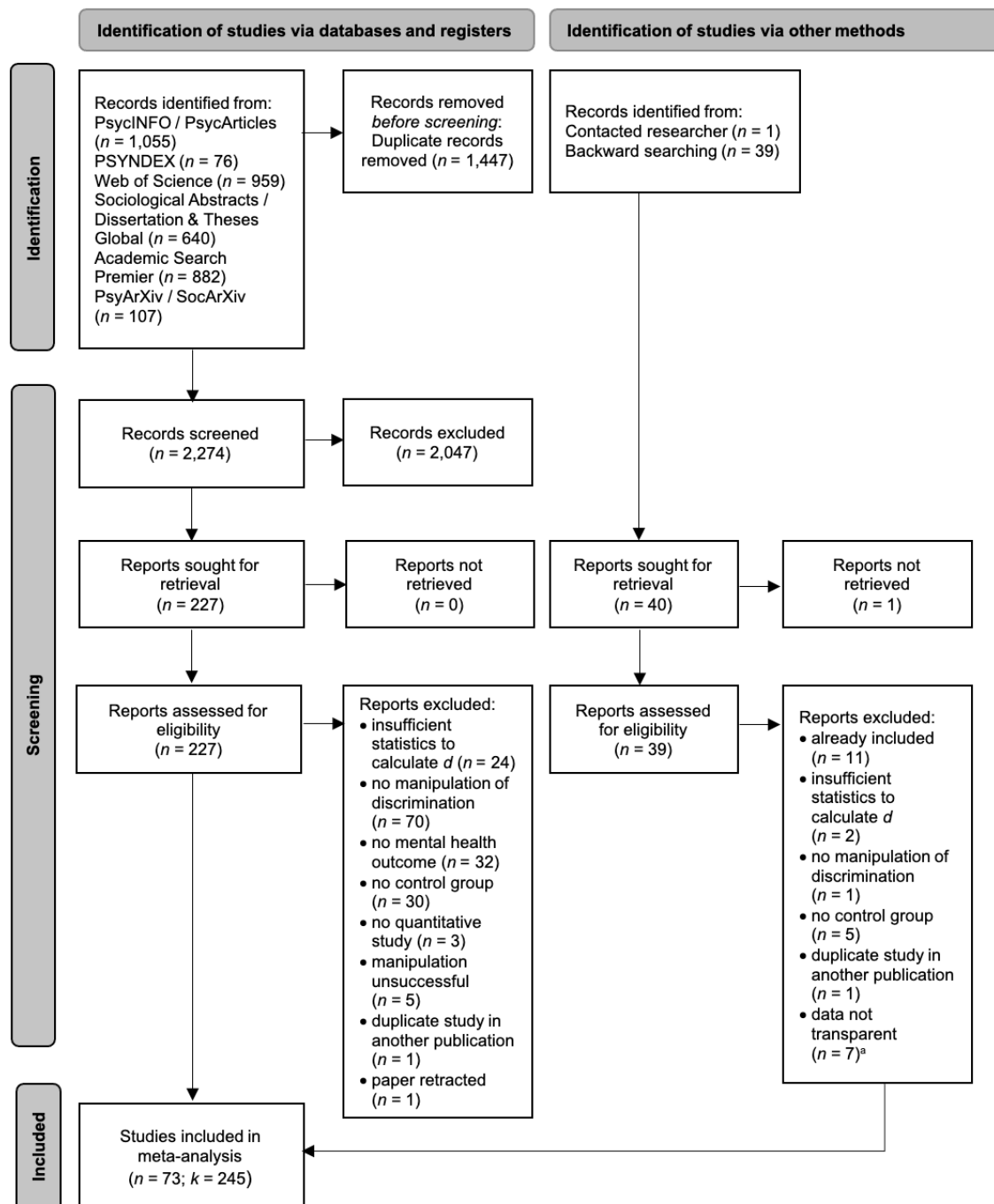
Relevant keywords were identified and a search strategy was developed with the support of an independent research librarian; search strategies from prior meta-analyses (Pascoe & Smart Richman, 2009; Schmitt et al., 2014) and valuable input from the reviewers were also considered. First, systematic literature searches were conducted (on September 02, 2022) using the databases APA PsycInfo, PsycARTICLES, PSYINDEX, Sociological Abstracts, Web of Science, and Academic Search Premier to retrieve relevant published work, and ProQuest Dissertation and Theses Global, PsyArXiv, and SocArXiv to retrieve relevant unpublished work. Discrimination-related keywords were used in combination with mental-health-related keywords and keywords relating to experimental designs. Because both free and controlled vocabularies (e.g., Thesaurus in PsycINFO, Subjects in Sociological Abstracts) were used, the keywords were adapted to the different databases. For a detailed description of the search strategy including keywords, see Table S1.1. The search was cross-referenced using forward and backward searches. Forward searches on relevant studies found in the systematic literature search were performed using Web of Science to identify later articles that cited them. Backward searches were performed on relevant meta-analyses (e.g., Pascoe & Smart Richman, 2009; Schmitt et al., 2014⁴) and reviews (e.g., Williams et al., 2019) by examining their reference lists.

All searches together identified a total of 3,719 records. After the removal of duplicates, the eligibility of the studies was assessed in two steps: First, titles and abstracts of the remaining 2,272 records were screened to exclude irrelevant studies (e.g., correlational studies). At the beginning of the screening process, two coders independently determined the

⁴ Nine records included in the meta-analysis of experimental studies on the mental health/well-being effect of discrimination by Schmitt et al. (2014) could not be included because of (a) unavailability of unpublished data or inability to retrace the calculation of effect sizes (seven records), (b) insufficient reporting of data that could not be obtained from the authors (one record, published in 1993), or (c) inability to retrieve the record (one record).

inclusion of 200 randomly chosen studies. Because the agreement rate (92%) was high (Cooper et al., 2019), the remaining studies were screened by only one coder. Second, the 226 studies selected during the first step were screened in full for eligibility. If selected studies were neither electronically retrievable nor obtainable from the authors, they were excluded. Using the inclusion and exclusion criteria described above, 73 studies were finally included in the analysis, reporting data from 117 independent samples and 245 effect sizes. See Figure 1.1 for a PRISMA flow diagram depicting the screening and selection process.

Figure 1.1
PRISMA Flow Diagram



Note. PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses. The flow diagram depicts how studies were identified for the meta-analysis (Page et al., 2021). n indicates the number of primary studies, k the number of effect sizes.

^a Unpublished data from the meta-analysis by Schmitt et al. (2014) received via mail that were excluded because it was not possible to retrace the calculation of effect sizes.

Coding of Studies

For the data extraction, we developed a standardized coding manual, which a trained research assistant piloted using 10 randomly chosen eligible studies. We solved any discrepancies encountered by consensus and changed the manual accordingly (see Table S1.2 for the final coding manual). The information of each study was coded at four hierarchically linked levels: (a) study level, (b) experiment level, (c) sample level, and (d) effect-size level. Any information not reported was treated as a missing value and omitted from the analyses. The data were extracted independently by two coders. To assess the intercoder reliability, Krippendorff's (2004) alpha and percentage agreement were calculated in R using the *irr* package (Gamer et al., 2019). Both reliability coefficients showed good intercoder reliability for all variables of interest (Krippendorff's alpha range: .70 to 1; percentage agreement range: 84.9 to 100%; see Table S1.3). All disagreements were reviewed, remarks for further refinement were added to the coding manual, and the coding entries were corrected using the respective primary study.

Study Quality and GRADE

The methodological quality of the experiments reported by the primary studies was assessed with an adapted version of the Study Design and Implementation Assessment Device (Study DIAD; Valentine & Cooper, 2008), including the fit between concepts and operations, clarity of causal inference, generality of findings, precision of outcome estimation, and statistical reporting (see Table S1.4). The results of the assessments were summed to obtain a quality score for each experiment. Please note that the grading of the study quality does not necessarily reflect the methodological quality of the primary study itself but rather pertains to the information and data relevant to this meta-analysis. To rate the overall quality of the body of evidence contributing to the meta-analysis, the grading of recommendations, assessment, development, and evaluation (GRADE) approach (Schünemann et al., 2013) was used. The quality (certainty in effect estimates) was determined by assessing the following criteria: (a)

limitations of study design, execution, and sampling (risk of bias), (b) indirectness (poor applicability of treatment, comparators, and outcomes), (c) inconsistency of results (heterogeneity between effect sizes; defined as $I^2 > 50\%$), (d) imprecision of results ($N < 400$ participants), and (e) suspected publication bias and selective reporting.

Calculation of Effect Sizes

To determine effect sizes, the standardized mean difference (Cohen's d) was used. Negative effect sizes indicate poorer mental health (e.g., decreased positive and increased negative affect) for the group exposed to manipulation of discrimination compared to the control group. If statistics other than d were reported (e.g., means and standard deviations), the statistics were converted into d and the corresponding variance v_d by using the Campbell web-based calculator (Wilson, n.d.) with the formulas of Lipsey and Wilson (2001). Because regression coefficients differed fundamentally in the type of included control variables, they were not used for the analysis. If a study mentioned only that an effect was not significant, d was coded as zero (applied to 11 effect sizes; Lipsey & Wilson, 2001). When authors reported insufficient statistics to calculate d (e.g., incomplete data or regression coefficients), the authors were contacted and asked to provide the respective data. Finally, to account for the positive bias of Cohen's d in small samples, d and v_d were adjusted using the formula provided by Cooper et al. (2019, p. 213). These adjustments resulted in Hedges's g , an unbiased estimate of the effect size (Cooper et al., 2019).

Several included primary studies reported comparisons of more than two experimental groups with one control condition. For example, some studies used different forms of delivering discrimination in separate experimental groups, such as conveying negative stereotypes through drama or comedy films (Schmader et al., 2015), manipulating discrimination as legitimate or illegitimate (Hansen & Sassenberg, 2006), or inducing discrimination through racist tweets or retweets (Lee-Won et al., 2017). Additionally, some studies investigated benevolent and hostile discrimination in two separate experimental

groups—which interestingly was observed solely in manipulations of sexism (e.g., Bradley-Geist et al., 2015; Major et al., 2003; Spaccatini & Roccato, 2021). To maintain independence assumptions and because the differences between the experimental groups were not the primary focus of this meta-analysis, we calculated pooled effect sizes and variances by considering the variance between the two experimental groups to create a single pair-wise comparison (as recommended by the Cochrane Collaboration; Higgins et al., 2022). Overall, this approach affected 21 effect sizes from five studies for different forms of delivery and 28 effect sizes from seven studies for mean values across benevolent and hostile forms of sexism. In contrast, some studies reported pervasive and single-event manipulations as two experimental groups compared to one control condition or one experimental group with two control conditions, such as a neutral and a nondiscriminatory stress condition or personal and external attributions compared to discrimination attributions in the experimental group. The differences between these conditions and resulting effect sizes are qualitatively very different, have different theoretical implications, and are indeed the focus of this meta-analysis. Thus, these comparisons were included separately with shared experimental (or control) conditions divided out evenly among comparisons so that each pair-wise comparison could be investigated (based on the recommendations by Higgins et al., 2022). This affected eight effect sizes from two studies for single-event and pervasive experimental conditions (Lin, 2012; Schmitt et al., 2003), six effect sizes from two studies for neutral and nondiscriminatory stress (Shenton-Bewsh et al., 2016; Stepanova et al., 2019), and 24 effect sizes from three studies for personal and external attributions as control conditions (Hansen & Sassenberg, 2006; Major et al., 2003; Schmitt, 2002).

Data Synthesis

As the primary studies differed in their manipulation design, settings, and measurement of mental health outcomes, there might be not just one true effect size but a distribution of true effect sizes. This potential heterogeneity between studies was considered

with a random-effect assumption (Cooper et al., 2019). Most studies reported multiple effect sizes, leading to a hierarchical data structure in which effect sizes are nested within studies (Van den Noortgate et al., 2013). To account for this interdependence of effect sizes (i.e., sampling covariation) while preserving all information and maximizing the statistical power, a three-level meta-analytic model was fitted to the data (Assink & Wibbelink, 2016). The model considers three different sources of variance: sampling variance of the effect sizes (i.e., between participants) at Level 1, variance between effect sizes within the same primary study at Level 2, and variance between studies at Level 3 (Van den Noortgate et al., 2013). To estimate the model parameters, the restricted maximum likelihood method was applied. All model coefficients were tested using the Knapp and Hartung (2003) adjustment to decrease the probability of unjustified significant results (Assink & Wibbelink, 2016). For significance testing, an alpha level of 5% and 95% confidence intervals (CIs) were used. All analyses were conducted in R version 4.0.5 (R Core Team, 2020) using the *metafor* package (Viechtbauer, 2010).

Heterogeneity

Following the recommendations of the Cochrane Collaboration (Deeks et al., 2021), Cochran's Q test was used to assess homogeneity and I^2 to assess heterogeneity. Q tests were calculated to assess the null hypothesis of homogeneity among effect sizes. A nonsignificant result indicates that variance between effect sizes derives from random sampling error rather than systematic differences. I^2 statistics quantify the degree of heterogeneity by describing the percentage of systematic variability in effect estimates (Deeks et al., 2021). A multilevel adapted version of I^2 was used to evaluate the proportions of systematic variation for the estimated true effects within studies (σ^2_1 at Level 2) and between studies (σ^2_2 at Level 3). In determining the significance of the within- and between-study variance, two independent one-sided log-likelihood-ratio tests were performed, in which the deviance of the full model was compared with the deviance of the model without one of the two variance parameters. To

calculate how much variance can be attributed to random sampling variance (Level 1) and how much to heterogeneity between effect sizes within studies (Level 2) and between studies (Level 3), we followed the guideline from Assink and Wibbelink (2016). For the evaluation of the degree of heterogeneity, Deeks et al. (2022) suggested the following conventions: $I^2 < 40\%$ might not be important, $I^2 = 30\%$ to 60% may represent moderate, $I^2 = 50\%$ to 90% substantial, and $I^2 = 75\%$ to 100% considerable heterogeneity. The overlap between these categories highlights the importance of considering the magnitude of an effect size and the strength of evidence for heterogeneity.

Moderator and Subgroup Analyses

If heterogeneity assessment indicated significant variance on the within-study or between-study level, we conducted moderator analyses using three-level mixed-effects meta-regression to test the proposed moderator and control variables that might explain the heterogeneity. In the mixed-effects model, the effect sizes are considered random and potential moderators as fixed effects (e.g., Cooper et al., 2019). The significance of moderators was tested with omnibus F tests (Assink & Wibbelink, 2016). Prior to testing, continuous variables (gender proportions of the sample, mean age of the sample, study quality, publication year of study) were centered around their means and dichotomous dummy variables were created for all categorical variables (i.e., manipulation type, group status, region, education level of sample). Group status was classified as marginalized when the sample possessed a social identity that is historically marginalized and that was subject to the induced discrimination type within the respective study. For instance, when the discrimination type in a study was sexism, samples including participants identifying as men were categorized as non-marginalized, samples including participants identifying as women as marginalized, and samples including men and women as having a “mixed group status”. In the same study on sexism, in instances where a sample included participants identifying as men and a marginalized identity (e.g., being part of an ethnic minority), the classification of

the sample remained non-marginalized. This determination is grounded in the premise that the induced discrimination targets the non-marginalized identity of the participants. All samples from studies on discrimination targeting non-marginalized identities, such as specific university study majors, were consistently classified as non-marginalized, as this form of discrimination is not rooted in stigma, cultural prejudice, and power imbalances. Education level was classified according to the International Standard Classification of Education (UNESCO Institute for Statistics, 2012) and aggregated into low, medium, and high education according to the suggestions from Eurostat (Eurostat, 2018). To exploratively test overall effects for specific manipulation types, different types of research paradigms, samples with different group status, types of discrimination, and different mental health outcomes, we conducted separate three-level random-effects meta-analyses for all subgroups. As an additional exploratory sensitivity analysis, the subgroups for research paradigms and mental health outcome types were additionally explored in the different manipulation types. Moderator and subgroup analyses with variables assessed with less than 10 effect sizes per category should be interpreted with caution and thus are not reported in the text (Deeks et al., 2021). To ensure completeness and facilitate the use of the data in future meta-analyses, details on these tests are presented in the overview tables of results and supplements.

Publication Bias

A common issue in meta-analytic research is that nonsignificant or unfavorable results of primary studies are less likely to be published (*publication bias*) or reported (*reporting bias*) and are therefore difficult to locate. Not including these effect sizes in a meta-analysis may lead to an overestimation of the true effect size (Cooper et al., 2019). We assessed the risk of publication and reporting bias in several steps. First, the symmetry of a contour-enhanced funnel plot in which the effect sizes were plotted against their precision expressed in standard errors was inspected visually and statistically (Peters et al., 2008). For significance

testing, Egger's regression test (Egger et al., 1997) was adapted to the multilevel meta-analytic structure by performing a meta-regression with the standard errors as moderator variable.

Results

Study Characteristics

The present meta-analysis included 73 primary studies, reporting on 93 experiments and 117 independent samples, with a total of $N = 12,097$ (range: 22–694) participants. On average 3.36 (range: 1–14) effect sizes were extracted from each included study. The publication year of the studies ranged from 1975 to 2022 ($Mdn = 2012$); most experiments were conducted in North America ($n = 57$) and in Europe ($n = 28$), a few in Australia ($n = 2$) and Asia ($n = 4$); for the remaining two experiments no information on the region of data collection was reported. For detailed information about each included study, see Table S1.5. The mean age of the samples was 30.03 years ($SD = 16.69$, $Mdn = 22.84$, range: 6.50–76.50). The proportion of females was high at average 76% (range: 0%–100%). For a distribution of age and gender by number of effect sizes, see Figure S1.1. Regarding ethnicity, the mean proportion of individuals self-identifying as non-White was 66% (range: 0%–100%). Education level could not be classified for 21% of the samples; the remaining samples mostly (87%) consisted of university students or participants with an academic degree. The majority of samples (74%) were characterized by a marginalized identity, as indicated by the type of discrimination induced in the respective experiments. The remaining samples were associated with a non-marginalized (18%) or mixed group status that included individuals with both marginalized and non-marginalized group status (9%). These two groups—with non-marginalized and mixed group status—were combined into a single category for subsequent analyses describing samples with a non-marginalized group status.

The most used settings for the manipulation of discrimination were daily life (e.g., discrimination at the entrance to a nightclub or poor service at a restaurant; 36% of all effect sizes) and education (e.g., discrimination in academic test evaluations; 31%), followed by

employment (e.g., discrimination in applicant selection for internships or entry-level positions; 21%). Most effect sizes measured the impact of either racism (42%) or sexism (27%); only a few effect sizes represented the effect of body-related discrimination including overweight-based discrimination (7%), ageism (7%), heterosexism (7%), status-related discrimination based on university or study major affiliations (4%), and other forms of discrimination (6%), namely, religious discrimination ($k = 3$), mental illness stigma ($k = 3$), linguicism ($k = 1$), and other (random) group status ($k = 7$). Most studies were single-event manipulations (89%) consisting mostly of induction of discrimination as a psychosocial stressor compared with neutral control conditions (45% of all effect sizes). Regarding research paradigms, most effect sizes stemmed from vicarious (46%) and direct experience (38%) paradigms, with only 16% from salience induction paradigms. Vicarious experience and salience induction paradigms were mostly utilized by single-event studies, whereas vicarious experience paradigms were used in single-event and pervasive manipulations (details on research paradigms by manipulation type can be found in Table S1.6). Further information on disaggregated single-event and pervasive manipulation types and utilized research paradigms are summarized with other characteristics of all effect sizes by discrimination type in Table 1.2 and by each study in Table S1.5. Of the included 93 experiments, 61% reported significant manipulation checks; for the remaining 39% experiments, no manipulation check was reported (experiments with statistically not significant manipulation checks were excluded, see Inclusion and Exclusion Criteria section). Table S1.5 summarizes information on included studies and investigated samples (i.e., publication type, region of data collection, and group status), research paradigms and respective manipulation checks, and mental health outcomes.

For all effect sizes, mental health was assessed directly following the experimental procedures. Although most primary studies did not report exact information on the time elapsed between manipulation of discrimination and assessment of outcomes, the

experimental design descriptions provided an indication. Despite the immediate assessment of outcomes, 27 effect sizes were based on more chronic measures of mental health outcomes (e.g., trait-based measures of self-esteem using the Rosenberg-Self-Esteem Scale by Rosenberg, 1979, or subjective perceptions of stress over the previous 10 days measured by the Perceived Stress Scale by Cohen et al., 1983), and the remaining 218 effect sizes were based on acute assessments of mental health (e.g., state-based measures of self-esteem using the State Self-Esteem Scale by Heatherton & Polivy, 1991, or acute affect measures such as the Multiple Affect Adjective Check List by Zuckerman & Lubin, 1985). Regarding the type of mental health outcome, 39% of effect sizes pertained to self-directed and 33% to distress-related mental health outcomes, with fewer effect sizes related to other-directed externalizing (16%) and well-being-related (13%) outcomes. We excluded one effect size on body dissatisfaction as it is not suited to be assigned to one of the specific mental health types and would result in incongruity with the other effect sizes. Further details on the distribution of specific mental health outcomes are provided in Figure S1.2.

Table 1.2
Effect Size Characteristics by Discrimination Type

Variable and category	Total (<i>k</i> = 245)	Sexism (<i>k</i> = 103)	Racism (<i>k</i> = 67)	Body related (<i>k</i> = 16)	Status related (<i>k</i> = 11)	Ageism (<i>k</i> = 17)	Hetero- sexism (<i>k</i> = 17)	Other (<i>k</i> = 14)
Geographical region								
North America	166	26	55	8	4	11	58	4
Europe	56	16	18	0	0	0	21	1
Australia	6	2	4	0	0	0	0	0
Asia	11	8	0	1	0	0	2	0
Setting								
Employment	52	28	10	3	8	3	0	0
Education	77	47	27	0	3	0	0	0
Health care	9	0	0	0	0	8	0	1
Interpersonal	4	1	1	0	0	0	0	2
(Social) Media	11	0	8	0	0	0	0	3
Daily life	87	27	17	13	0	6	17	7
Political advertisement	5	0	4	0	0	0	0	1
Manipulation type								
Single event	211	92	53	13	10	15	14	14
vs. personal attribution	57	34	16	0	2	3	0	2
vs. external attribution	19	13	0	0	6	0	0	0
vs. neutral control	111	37	30	12	2	11	9	10
vs. nondiscriminatory stress	19	3	4	1	0	1	8	2
other single event ^a	8	5	3	0	0	0	0	0
Pervasive	31	11	14	3	1	2	0	0
vs. single-event	6	2	4	0	0	0	0	0
vs. pervasive against outgroup	7	3	3	0	1	0	0	0
vs. neutral control	16	4	7	3	0	2	0	0
vs. external attribution	2	2	0	0	0	0	0	0
Research paradigm								
Direct experiences ^b	94	50	30	9	0	1	0	4
Salience inductions ^c	39	9	11	0	0	13	0	6
Vicarious experiences ^d	112	44	26	7	11	3	17	4
Group status ^e								
Marginalized	181	81	57	5	0	13	17	8
Non-marginalized	64	22	10	11	11	4	0	6
Manipulation check								
Significant	154	41	43	0	3	11	51	5
Not reported	91	11	34	9	1	0	36	0
Mental health outcome								
Well-being-related ^f	32	9	8	4	0	2	7	2
Distress related ^g	80	11	26	5	2	1	33	2
Self-directed ^h	95	22	31	0	2	6	33	1
Other-directed ⁱ	38	10	12	0	0	2	14	0

Note. *k* represents the number of effect sizes.

^a Includes single-event manipulations compared to a mean of neutral and nondiscriminatory stressor conditions (*k* = 3 from one experiment where data was not sufficient to include pair-wise comparisons) and compared to a control condition with a lower level of discrimination than that in the experimental groups (*k* = 5 from one experiment).

^b Experiencing an event, stereotype threat followed by performing a task.

^c Autobiographical recall, making general stereotypes about one's group salient.

^d Imagination, study material (text, images, video, audio) that included discrimination-related information.

^e Group status was classified as marginalized when the sample possessed a social identity that was historically marginalized and subject to the induced discrimination type in the study. For example, when discrimination type was sexism, samples including participants identifying as men were categorized as non-marginalized, samples including participants identifying as women as marginalized, and samples including men and women as "mixed"; when samples included participants identifying as men and a marginalized identity (e.g., being part of an ethnic minority), the classification of the sample was non-marginalized. All samples from studies on discrimination targeting non-marginalized identities, such as specific university study majors, were classified as non-marginalized.

^f Well-being, life satisfaction, positive affect.

^g Psychological distress, negative affect, anxiety.

^h Self-esteem, depressed affect, other internally directed emotions such as shame or guilt.

ⁱ Externally directed negative emotions such as hostility and anger.

Overall Effect Analysis and Heterogeneity

In line with Hypothesis 1 that stated that discrimination has a negative effect on mental health, the three-level random-effects meta-regression revealed a mean effect of $g = -0.30$ ($p < .001$, 95% CI [-0.40, -0.19]) for the effect of discrimination on mental health across all studies. The Q test of homogeneity showed significant variation between all effect sizes, $Q(244) = 2,183.58$, $p < .001$. The within-study variance component, $\sigma^2_1 = 0.16$, $\chi^2(1) = 269.71$, $p < .001$, and the between-study variance component, $\sigma^2_2 = 0.12$, $\chi^2(1) = 26.56$, $p < .001$, were significant. Of the total heterogeneity, $I^2 = 50\%$ could be attributed to within-study variance at Level 2, $I^2 = 37\%$ to between-study variance at Level 3, and 13% to random sampling variance at Level 1.

Moderator Analyses

To explain the significant and substantial variance, we performed meta-regression analyses to test the moderator hypotheses (Hypotheses 2–5). Differences in the degrees of freedom of the significance tests occurred, because not all information on the respective moderator was available for all effect sizes. For all parameter estimates of the meta-regression models, see Table 1.3.

Supporting Hypothesis 2, postulating a stronger effect for pervasive than for single-event manipulations, the omnibus test for manipulation type with single-event discrimination as reference category was significant, $F(1, 243) = 4.68$, $p = .032$, with a stronger mental health effect in pervasive ($g = -0.55$) than in single-event manipulations ($g = -0.25$). The residual heterogeneity of the meta-regression model was significant, $Q(243) = 2,095.01$, $p < .001$.

Hypothesis 3 stated a stronger effect for discrimination against marginalized identities compared to non-marginalized identities. The omnibus test for group status with marginalized identity as reference category approached significance, $F(1, 243) = 3.57$, $p = .060$, suggesting a trend towards a weaker mental health effect in non-marginalized ($g = -0.16$) than in

marginalized samples ($g = -0.34$). The residual heterogeneity was significant, $Q(243) = 2,097.70, p < .001$.

Hypothesis 4 postulating a stronger mental health effect of discrimination for women than for men was not supported: The omnibus test for gender was not significant; the residual heterogeneity was significant, $Q(236) = 2,125.62, p < .001$.

Inconsistent with Hypothesis 5, assuming a stronger effect of discrimination on mental health for younger than for older people, the omnibus test for age was not significant; the residual heterogeneity was significant, $Q(176) = 1,988.31 p = .340$.

Control Variables

Adding control variables separately to the meta-regression model did not change the significance and size of the mean effect of discrimination on mental health. Therefore, the mean effect remained robust when we controlled for publication year, region, education level of the samples, or methodological quality (see all estimates in Table 1.3). The omnibus test for the publication year was significant ($p = .027$); the regression coefficient ($\beta = -0.01$) indicates a slightly stronger effect of discrimination in more recently published studies. The omnibus tests for geographical region and methodological study quality were not statistically significant.

Table 1.3*Overview of Moderator Analyses for the Effect of Perceived Discrimination on Mental Health*

Moderator variable	<i>k</i>	Intercept/mean <i>g</i> [95% CI]	β [95% CI]	<i>F</i> ^a	<i>df</i>	<i>p</i> ^b	σ^2_1	σ^2_2
Manipulation type				4.68	1, 243	.032	0.16	0.12
Single event (ref.)	218	-0.25 [-0.37, -0.14]						
Pervasive	27	-0.55 [-0.80, -0.30]	-0.29 [-0.56, -0.03]					
Group status ^c				3.57	1, 243	.060	0.16	0.11
Marginalized (ref.)	181	-0.34 [-0.46, -0.23]						
Non-marginalized	64	-0.16 [-0.33, 0.02]	0.19 [-0.01, 0.38]					
Gender	238	-0.29 [-0.39, -0.18]	-0.00 [-0.01, 0.00]	0.68	1, 236	.411	0.16	0.11
Age	178	-0.31 [-0.44, -0.17]	-0.00 [-0.01, 0.00]	0.91	1, 176	.340	0.19	0.14
Publication year ^d	245	-0.29 [-0.39, -0.19]	-0.01 [-0.03, -0.00]	4.94	1, 243	.027	0.16	0.10
Region ^d				1.54	1, 235	.205	0.16	0.12
North America (ref.)	166	-0.22 [-0.35, -0.09]						
Europe	56	-0.43 [-0.64, -0.22]	-0.21 [-0.46, 0.04]					
Asia	11	-0.61 [-1.11, -0.11]	-0.39 [-0.90, 0.13]					
Australia	6	-0.14 [-0.78, 0.49]	0.08 [-0.57; 0.72]					
Education ^d				180	3, 180	.308	0.17	0.02
University students (ref.)	154	-0.19 [-0.28, -0.09]						
Pupils	11	0.04 [-0.29, 0.38]	0.23 [-0.12; 0.58]					
High education	18	.02 [-0.24, 0.28]	0.20 [-0.07, 0.48]					
Medium	2	0.03 [-0.89, 0.95]	0.21 [-0.71, 1.14]					
Quality ^d	245	-0.29 [-0.40, -0.19]	-0.03 [-0.11, 0.06]	0.45	1, 243	.505	0.16	0.12

Note. Negative effect sizes indicate poorer mental health (e.g., decreased positive and increased negative affect) for the group exposed to manipulation of discrimination compared to the control group. All continuous variables are centered around their means. Ref. = reference category of dummy-coded categorical variables; *k* = number of effect sizes; *g* = Hedges's *g*;

β = regression coefficient; CI = confidence interval; σ^2_1 = variance within studies (Level 2); σ^2_2 = variance between studies (Level 3).

^aOmnibus test of all regression coefficients in the model.

^b*p* value of the omnibus test.

^cGroup status was classified as marginalized when the sample possessed a social identity that was historically marginalized and subject to the induced discrimination type in the study. For example, when discrimination type was sexism, samples including participants identifying as men were categorized as non-marginalized, samples including participants identifying as women as marginalized, and samples including men and women as "mixed"; when samples included participants identifying as men and a marginalized identity (e.g., being part of an ethnic minority), the classification of the sample was non-marginalized. All samples from studies on discrimination targeting non-marginalized identities, such as specific university study majors, were classified as non-marginalized.

^dControl variable.

Exploratory Analyses

Subsets for the identified different types of manipulations, research paradigms, samples with different group status, discrimination types, and mental health outcome types were built to conduct separate three-level random-effects meta-analyses. All estimated parameters for the exploratory subgroup analyses can be obtained from Table 1.4. For funnel plots, see Figure S1.3.

Regarding single-event manipulation types, attributions to discrimination compared with personal attributions ($g = -0.02, p = .863$) or external attributions ($g = -0.27, p = .132$) showed no significant overall effect on mental health. Single-event studies comparing the induction of discrimination as a psychosocial stressor with a neutral control ($g = -0.33, p < .001$) or other nondiscriminatory stressors ($g = -0.32, p < .001$) showed a significant negative overall effect on mental health, descriptively comparable in size. Pervasive discrimination against the ingroup compared with a neutral control condition showed a significant overall effect on mental health ($g = -0.58, p = .045$), which was larger than the effect in single-event manipulations. The other types of pervasive manipulation (compared to a single-event or pervasive discrimination against an outgroup) could not be tested because the number of effect sizes was smaller than 10.

The separate meta-analyses for subgroups of research paradigms and mental health outcomes showed an effect approaching significance for direct experience paradigms ($g = -0.12, p = .072$), the overall effects for salience induction paradigms ($g = -0.31, p < .001$) and vicarious experience paradigms ($g = -0.52, p = .009$) were descriptively larger and significant. Additional exploratory sensitivity analyses to assess potential confounding of research paradigms and manipulation types showed no significant overall effects for all research paradigms in single-event studies comparing attributions to discrimination with personal and external attributions (all $ps > .4$). Please note that the salience induction paradigms in this manipulation type produced fewer than 10 effect sizes and could not be tested adequately. In

single-event studies comparing induction of discrimination as a psychosocial stressor with a neutral control or nondiscriminatory stressors, the overall effect was not significant for direct experience paradigms ($g = -0.16, p = .147$), but again, the overall effect was significant for salience induction ($g = -0.36, p < .001$) and vicarious experience ($g = -0.42, p = .006$) paradigms. In pervasive manipulations, the overall effect for vicarious experience paradigms was significant ($g = -0.52, p = .009$); the subsets for direct experiences and salience induction paradigms in pervasive manipulations consisted of fewer than 10 effect sizes each and thus could not be adequately tested. For detailed information and all estimated parameters for the exploratory sensitivity analyses, see Table S1.7.

The separate meta-analysis on subsets of samples with marginalized identities (respective to the type of induced discrimination) showed a highly significant negative overall effect of discrimination on mental health ($g = -0.34, p < .001$), whereas the overall effect in the subset of non-marginalized samples was not significant ($g = -0.18, p = .113$).

Because there were fewer than 10 effect sizes for religious discrimination, mental illness stigma, linguicism, and other forms of discrimination based on (random) group status, these were combined as “other” to form a subgroup. The meta-analytic models for experimentally induced sexism ($g = -0.30, p = .003$), racism ($g = -0.32, p = .001$), and heterosexism ($g = -0.66, p = .043$) showed significant overall effects on mental health, with comparable effect sizes for sexism and racism, whereas heterosexism showed descriptively the strongest effect size. The effects of ageism ($g = -0.25, p = .099$) and the subgroup of other forms of discrimination ($g = -0.25, p = .070$) were comparable in size, but below our set significance level of $p < .05$. The separate meta-analyses for body-related ($g = -0.22, p = .176$) and status-related ($g = -0.13, p = .632$) forms of discrimination were not significant.

For the different categories of mental health outcomes, namely, well-being-related (well-being, life satisfaction, positive affect), distress-related (psychological distress, negative affect, anxiety), self-directed (self-esteem, depressed affect, other internally directed emotions

such as shame or guilt), and other-directed (externally directed emotions such as hostility and anger) outcomes, four subsets were built. Note that a negative effect indicates poorer mental health, for example, decreased positive affect and increased negative affect. The separate three-level random-effects meta-analyses descriptively displayed the largest effects of discrimination on other-directed negative emotions ($g = -0.66, p < .001$) and distress-related mental health outcomes ($g = -0.41, p < .001$). For well-being-related ($g = -0.18, p = .104$.) and self-directed ($g = -0.08, p = .207$) outcomes, the overall effects were smaller and statistically not significant.

Additional exploratory analyses to assess whether the differences between mental health outcome types vary for single-event compared to pervasive discrimination showed significant overall effects of single-event studies on distress-related ($g = -0.41, p < .001$) and other-directed ($g = -0.55, p < .001$) mental health outcomes, but no significant overall effect for well-being-related ($g = -0.17, p = .175$) or self-directed ($g = -0.05, p = .453$) mental health outcomes. In studies using pervasive discrimination manipulations, only self-directed outcomes provided more than 10 effect sizes and showed a significant overall effect ($g = -.47, p = .016$), in contrast to the subset of single-event studies. For detailed information and all estimated parameters for the additional exploratory analyses, see Table S1.6.

Table 1.4
Exploratory Subgroup Analyses

Variable	<i>k</i>	<i>g</i>	95% CI	σ^2_1	σ^2_2	Residual heterogeneity
Manipulation type						
Single-event discrimination: negative outcome with attribution to discrimination compared to						
personal attribution	57	-0.02	[-0.20, 0.16]	0.40	0.00	$Q(56) = 289.87^{***}$
external attribution	19	-0.27	[-0.62, 0.09]	0.10	0.10	$Q(18) = 64.53^{***}$
Single-event discrimination: discrimination stressor compared to						
neutral control	111	-0.33 ^{***}	[-0.51, -0.17]	0.12	0.18	$Q(110) = 1,073.89^{***}$
nondiscriminatory stressor	19	-0.32 ^{***}	[-0.42, -0.21]	0.00	0.00	$Q(18) = 25.55$
other single event	8	-0.21 [*]	[-0.41, -0.00]	0.00	0.01	$Q(7) = 7.91$
Pervasive discrimination against the ingroup compared to						
neutral control	16	-0.58 [*]	[-1.15, -0.02]	0.18	0.38	$Q(15) = 494.99^{***}$
single-event against ingroup	6	-0.25	[-0.74, 0.25]	0.14	0.00	$Q(5) = 12.50^*$
pervasive against outgroup	7	-0.48 ^{**}	[-0.73, -0.23]	0.01	0.00	$Q(6) = 8.60$
external attribution	2	-0.72	[-4.34, -2.90]	0.00	0.00	$Q(1) = 0.79$
Research paradigm						
Direct experiences ^a	94	-0.12 [†]	[-0.26, 0.01]	0.04	0.09	$Q(93) = 271.96^{***}$
Saliency inductions ^b	39	-0.31 ^{***}	[-0.48, -0.15]	0.17	0.01	$Q(38) = 159.12^{***}$
Vicarious experiences ^c	112	-0.40 ^{***}	[-0.58, -0.22]	0.26	0.17	$Q(111) = 1,498.45^{***}$
Group status ^d						
Marginalized	181	-0.34 ^{***}	[-0.46, -0.22]	0.16	0.12	$Q(180) = 1826.40^{***}$
Non-marginalized	40	-0.18	[-0.40, 0.04]	0.23	0.05	$Q(39) = 196.23^{***}$
Discrimination type						
Sexism	103	-0.30 ^{**}	[-0.49, -0.11]	0.21	0.17	$Q(102) = 1,170.20^{***}$
Racism	67	-0.32 ^{**}	[-0.50, -0.13]	0.12	0.13	$Q(66) = 398.75^{***}$
Ageism	17	-0.25 [†]	[-0.54, 0.05]	0.01	0.08	$Q(16) = 39.74^{***}$
Heterosexism	17	-0.66 [*]	[-1.30, -0.03]	0.18	0.16	$Q(16) = 189.40^{***}$
Body-related	16	-0.22	[-0.55, 0.11]	0.00	0.11	$Q(15) = 39.60^{***}$
Status-related	11	0.13	[-0.46, 0.72]	0.70	0.00	$Q(10) = 82.87^{***}$
Other forms ^e	14	-0.25 [†]	[-0.53, 0.02]	0.17	0.00	$Q(13) = 62.85^{***}$
Mental health outcome type						
Well-being-related ^f	32	-0.18	[-0.39, 0.04]	0.03	0.14	$Q(31) = 110.15^{***}$
Distress-related ^g	80	-0.41 ^{***}	[-0.54, -0.28]	0.10	0.08	$Q(79) = 546.12^{***}$
Self-directed ^h	95	-0.08	[-0.21, -0.05]	0.13	0.07	$Q(94) = 532.41^{***}$
Other-directed ⁱ	38	-0.66 ^{***}	[-0.93, -0.39]	0.38	0.11	$Q(37) = 590.81^{***}$

Note. For exploratory subgroup analyses, separate meta-analyses under random effects assumption were conducted for the different types of manipulation, research paradigms, sample-group status, discrimination, and mental health outcomes. Separate meta-analyses with fewer than 10 effect sizes are displayed for completeness and should only be interpreted with caution. Negative effect sizes indicate poorer mental health (e.g., decreased positive and increased negative affect) for the group exposed to manipulation of discrimination compared to the control group. *k* = Number of effect sizes; *g* = Hedges's *g*; CI = confidence interval; σ^2_1 = variance within studies (Level 2); σ^2_2 = variance between studies (Level 3).

^a Experiencing an event, stereotype threat followed by performing a task.

^b Autobiographical recall, making general stereotypes about one's group salient.

^c Imagination, study material (text, images, video, audio) that included discrimination-related information.

^d Group status was classified as marginalized when the sample possessed a social identity that was historically marginalized and subject to the induced discrimination type in the study. For example, when discrimination type was sexism, samples including participants identifying as men were categorized as non-marginalized, samples including participants identifying as women as marginalized, and samples including men and women as "mixed"; when samples included participants identifying as men and a marginalized identity (e.g., being part of an ethnic minority), the classification of the sample was non-marginalized. All samples from studies on discrimination targeting non-marginalized identities, such as specific university study majors, were classified as non-marginalized.

^e Religious discrimination, mental illness stigma, linguisticism, and other (random) group status.

^f Well-being, life satisfaction, positive affect.

^g Psychological distress, negative affect, anxiety.

^h Self-esteem, depressed affect, other internally directed emotions such as shame or guilt.

ⁱ Externally directed negative emotions such as hostility and anger.

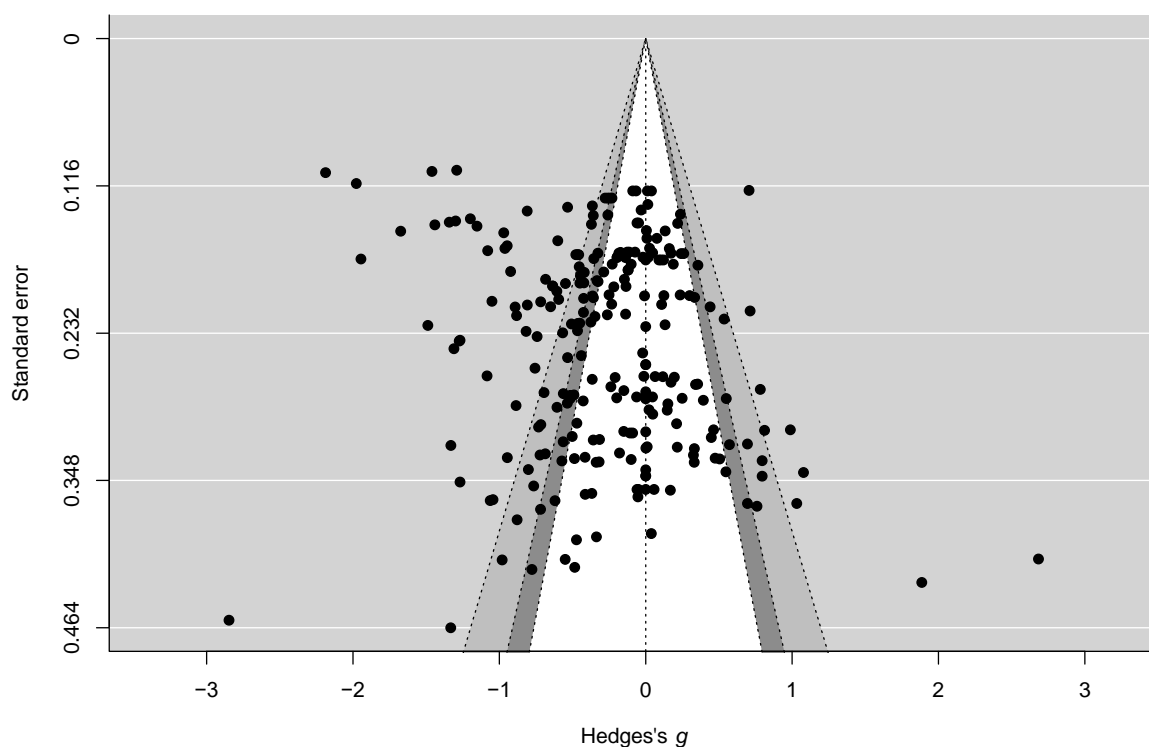
[†] $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

Publication Bias

The contour-enhanced funnel plot for the sizes of the effect of discrimination on mental health showed a slightly left-skewed distribution (see Figure 1.2). The adapted Egger's regression test was not significant, $F(1, 243) = 1.71, p = .192$, providing no strong evidence of asymmetry.

Figure 1.2

Contour-Enhanced Funnel Plot for the Overall Effect of Discrimination on Mental Health



Note. The diagonal lines represent confidence intervals of the probability that effect sizes differ from zero: white region $p > .10$, light-gray region $p = .10$ to $.05$, dark-gray region $p = .05$ to $.01$, region outside of the funnel plot $p < .01$. Please note that the funnel is centered not at the model estimate, but at zero (i.e., at the value under the null hypothesis of no effect). Negative effect sizes indicate poorer mental health (e.g., decreased positive and increased negative affect) for the group exposed to manipulation of discrimination compared to the control group.

Quality Assessment

On average, the study quality was 3.33 out of 6 ($SD = 1.17$, range: 1–5). Importantly, none of the included samples were representative of the general population or the subgroups studied, leading to a downgrading of the generality of samples for all included studies. Our assessment of the representativeness of the samples was based on the sampling strategy: Studies using probability sampling or, in the case of nonprobability sampling, if the authors reported a comparable distribution of (at least one) relevant participant demographic such as gender or ethnic identity, or socioeconomic status to representative surveys of relevant subgroups. All included studies utilized convenience sampling or provided insufficient information on the sampling strategy. The primary reasons for a decreased quality rating was a downgrade in the adapted Study DIAD categories “precision of reporting” and “outcome estimation.” Specifically, 51 experiments were downgraded because of insufficient reporting of precise sample sizes of conditions, and 43 experiments received a lower rating because of small sample sizes and also not reporting tests of statistical properties of the data (e.g., distributional and variance assumptions). Further, 36 experiments were downgraded owing to a lack of clarity in causal inference, primarily because they did not explicitly report on randomization, dropouts, or severe attrition overall. Fewer experiments were downgraded for low reliability of outcome measures (22 experiments) and because of possible disruption effects based on stark differences between experimental and control groups or unclear descriptions of study design and materials (three experiments).

The overall quality of the evidence contributing to the meta-analysis was rated as moderate. The substantial heterogeneity and lack of representativeness of the sample led to a downgrading of the quality rating by one level in each case. See Figure S1.4 for the detailed GRADE rating.

Discussion

The current meta-analysis quantified the impact of experimentally manipulated discrimination on mental health, using data from over 12,000 participants across 73 studies. The results support our main hypothesis that discrimination significantly diminishes mental health. This small to moderate negative effect remained significant and comparable in size after controlling for different study and sample characteristics, namely, publication year, region, education level, and study quality. Publication year moderated the effect of discrimination on mental health, with a stronger overall effect in more recent studies. Of the hypothesized moderators, manipulation type and group status influenced the mental health effect of discrimination. Specifically, the effect of discrimination on mental health was stronger in pervasive discrimination compared to single-event manipulations and showed a trend towards being stronger against marginalized compared to non-marginalized identities. No differences in the effect of discrimination on mental health were found by gender or age.

This meta-analysis also examined several exploratory research questions concerning specific types of manipulations, the use of different experimental paradigms, discrimination types, and facets of mental health: Discrimination had effects on mental health in studies inducing pervasive discrimination against the ingroup or single-event studies manipulating discrimination as a psychosocial stressor compared to control conditions. Further, studies using salience induction and vicarious experience paradigms showed significant overall effects on mental health, whereas paradigms using direct experience of discrimination only approached significance. Examining different types of discrimination, we found that the effect on mental health was strongest for heterosexism, racism, and sexism. Less robust experimental evidence was found for ageism and body-related discrimination, no effect was found for status-related discrimination and the subgroup “other forms of discrimination” that subsumed religious discrimination, mental illness stigma, linguicism, and discrimination on other (random) group status. Subgroup analyses on different facets of mental health showed

that discrimination increased negative facets of mental health, that is, other-directed negative emotions (e.g., anger, hostility) and distress-related outcomes (e.g., anxiety, negative affect), but did not affect positive well-being-related outcomes (e.g., positive affect, life satisfaction), nor did it impact self-directed outcomes (e.g., self-esteem, shame). This pattern of effects was also observed within the subgroup of single-event manipulations. Despite the limited number of effect sizes, the pattern persisted for pervasive forms of discrimination. Descriptively, there was one exception – pervasive discrimination showed a trend towards poorer self-directed mental health.

Interpretation of the Results

Overall Effect of Experimentally Induced Discrimination on Mental Health

This meta-analysis shows a small to moderate causal effect of discrimination on mental health, supporting Hypothesis 1. This effect did not change when controlling for different study and sample characteristics. This meta-analysis builds on and extends the evidence from prior meta-analytic reviews that also found a small to moderate association between perceived discrimination and mental health in correlational studies (e.g., $r = -.20$ in Pascoe & Smart Richman, 2009, and $r = -.23$ in Schmitt et al., 2014) by showing that discrimination harms mental health directly and immediately. The overall negative impact of discrimination on mental health contrasts with the to date most current meta-analysis that includes experimental studies on discrimination and found no significant overall effect (Schmitt et al., 2014). This discrepancy is likely due to at least two aspects: first, the broader focus on various types of discrimination manipulations in our meta-analysis, and second—due to this broader focus and 10 more years of research included—a considerably larger number of studies for analysis. Whereas Schmitt et al. (2014) focused on pervasive discrimination manipulations and single-event studies comparing attributions to discrimination with personal attributions, the current meta-analysis disaggregated the different manipulation types and compared their differential effects on mental health. Importantly, across the single-event

manipulation types examined by Schmitt et al. (2014; i.e., single-event studies comparing attributions to discrimination and personal attributions), we did replicate the nonsignificant overall effect also with the current and extended data. Further, since the meta-analysis by Schmitt et al., 2014, substantial advancements in methodological standards and techniques have emerged. Specifically, because of the multilevel structure, we were able to include multiple effect sizes from a single sample without aggregation, resulting in a considerable increase in the number of effect sizes analyzed. Therefore, this meta-analysis is an important extension and update to the previous meta-analysis (Schmitt et al., 2014) and the first to causally show that discrimination can diminish mental health.

Heterogeneity and Moderator Analyses

The heterogeneity analyses revealed a substantial amount of unexplained within- and between-study variance and we consequently examined potential moderators that could explain this variance. Identifying how moderators influence effect sizes is of both theoretical and practical relevance. Meta-analytic evidence for or against research hypotheses and theoretical frameworks could shape future research directions. Further, moderator analyses could identify protective and risk factors that might play an important role in practical interventions against the negative impact of discrimination on mental health. We discuss the findings from the moderator analyses in the following.

Manipulation Type: Single-Event and Pervasive Discrimination. Pervasive discrimination manipulations showed stronger effects on mental health than single-event manipulations, supporting Hypothesis 2. This effect is particularly noteworthy given that most effect sizes (89%) stemmed from single-event studies. These results are consistent with previous research (e.g., Schmitt et al., 2014), and might indicate that pervasive discrimination might be perceived as less avoidable and more uncontrollable than isolated single events of discrimination (Verkuyten, 1998). These findings are also in line with theoretical underpinnings about effects of discrimination on mental health: Pervasive discrimination

implies a rejection by society at large and thus a threat to the belief in a just world (Barreto & Ellemers, 2015). This might alter cognitive processes, such as decreasing self-mastery or extending hopelessness and pessimism. In turn, this can increase acceptance and internalization of the discrimination experience, leading to more pronounced mental health effects (Hatzenbuehler, 2009).

In the current meta-analysis, we have also further explored the mental health effects of specific single-event and pervasive discrimination manipulations, using separate meta-analyses (Exploratory Research Question 1). Because of the limited number of effect sizes from pervasive manipulations, a detailed exploration and interpretation of the mental health effects was possible only in the subgroup with a neutral control condition. In this subgroup, the separate meta-analysis showed a medium effect of pervasive discrimination compared to neutral control conditions on mental health—descriptively larger than the effects for all other manipulation types. To learn more about how specific pervasive manipulations of discrimination affect mental health, further research is needed on other types of control conditions, namely, control conditions that use pervasive discrimination against a nonrelevant outgroup, single-event manipulations, and external attributions.

Most of the identified effect sizes were from single-event manipulations that allowed for further specific exploration: For single-event studies manipulating discrimination as a psychosocial stressor—compared with neutral control groups or with other nondiscriminatory stressors—discrimination shows highly significant adverse mental health effects. These results are particularly noteworthy as they show that even inductions of discrimination in experimental settings that are limited by ethical and ecological constraints can have a stronger negative impact on mental health than other general stressors not related to discrimination. Single-event studies comparing attributions to discrimination with personal attributions showed no significant overall effect. This implies – in contrast to the predictions of the attributional ambiguity hypothesis – that attributions of single events to discrimination are not

less harmful for mental health than personal attributions. This finding replicates previous research (Schmitt et al., 2014). As one of the key mechanisms suggested to explain the protective function of attributions to discrimination, attributional ambiguity describes externalization of negative events away from the self. Hence, this meta-analysis further extends the findings of Schmitt et al. (2014) and assesses the overall effect in studies comparing attributions of a single negative event to discrimination with external attributions. Although we did not find a stronger mental health effect for attributions to discrimination than for external attributions, this was possibly due to a limited number of effect sizes and the assessment of primarily discrimination against non-marginalized identities.

Group Status. Hypothesis 3 approached statistical significance, suggesting that the mental health effects of discrimination against marginalized identities could be stronger compared to discrimination against non-marginalized identities. This finding is in line with our exploratory analyses (Exploratory Research Question 3). In separate meta-analyses, we found a significant mental health effect of discrimination against marginalized identities, whereas no effect on mental health was found for discrimination against non-marginalized identities. This is an interesting finding that underlines the importance of considering stigma as central component of the definition of discrimination. Discrimination, beyond its overt manifestation in unfair treatment based on social identity, is intrinsically tied to societal structures, cultural prejudice, and power dynamics. This perspective accentuates that discrimination does not merely consist of isolated events but rather operates within a broader framework of social hierarchies and systemic inequalities. However, given that our finding of a potentially stronger mental health effect of discrimination against marginalized compared to non-marginalized identities contrasts with Schmitt et al. (2014), who did not find a moderating effect of group status, the robustness of these findings needs to be examined in more diverse samples and settings. For example, the vast majority (84%) of the effect sizes described the effect of discrimination against marginalized identities. Further, experimental

laboratory settings might create greater comparability of discrimination experiences against marginalized and non-marginalized identities (cf. Schmitt et al., 2014). In laboratory studies, participants without marginalized identities may experience pervasive discrimination that they would not encounter in real-world settings. Conversely, although single-event discrimination against marginalized identities might reflect widespread and frequent discrimination experiences leading to greater mental health effects than for participants without respective marginalized identities, participants with marginalized identities may not perceive it as such in laboratory settings due to their inherently artificial nature. Moreover, whereas samples with marginalized identities were disadvantaged on the one dimension that was targeted by the discrimination manipulation (e.g., in studies inducing sexism, samples comprising individuals who self-identified as female were classified as having a marginalized identity, and those who self-identified as male as non-marginalized), they often had a more advantaged group status in other dimensions, such as education level or age.

Demographics: Gender and Age. Contrary to our hypotheses, we did not find a stronger effect of discrimination on mental health for individuals identifying as women compared to those who identify as men (Hypothesis 4) or for younger versus older people (Hypothesis 5). A methodological explanation might be that most of the extracted effect sizes came from samples that consisted predominately of individuals self-identifying as women in young adulthood (18 to 29 years). This could have resulted in too little statistical power to detect potential effects of gender and age on the impact of discrimination on mental health. The focus on women in young adulthood underscores the need for more diverse samples in experimental discrimination research (see Limitations below for further discussion).

Publication Year. We found a slightly stronger effect of discrimination on mental health in more recently published studies. How could this finding be explained? One explanation could be that researchers learned to design more potent discrimination manipulations over time. Yet, we do not see systematic differences in the utilization of

pervasive versus single-event manipulations by publication year, except that those single-event manipulations that yield significant mental health effects (i.e., comparing discrimination as a psychosocial stressor with a neutral control or other nondiscriminatory stressors) are more commonly used in recent studies. Further, the frequency of using different discrimination types could potentially explain why mental health effects of discrimination became stronger over the years: Studies on heterosexism – with comparably large effects – were only published from 2019 on, whereas studies with a focus on discrimination against non-marginalized academic identities – with no overall effects on mental health – were mostly published before 2011. Another explanation could be a heightened sensitivity of participants to discrimination over time. This is difficult to evaluate, but political efforts are actively engaging in enhancing awareness of discrimination (e.g., European Commission, n.d.), and the discussion on microaggressions and more subtle forms of discrimination has also reached the public through the media (Eschmann et al., 2020). A third possible explanation revolves around the increasing prominence of social media, leading to heightened visibility and pervasiveness of social injustices (see e.g., Hunt & Gruszczynski, 2021). This, in turn, could lead to more recent studies having higher impact on mental health.

Exploratory Findings

Research Paradigms. To explore potential differences in the impact of discrimination on mental health across various research paradigms, separate meta-analyses were conducted for the three categories of paradigms: direct experience, salience induction, and vicarious experience. Interestingly, discrimination manipulated by paradigms using direct experiences only approached statistical significance in influencing mental health. In contrast, paradigms using salience induction and vicarious experiences had a clear negative effect on mental health.

How can the different strength in effects be explained? The direct experience paradigms primarily involved laboratory situations in which a discriminatory event was

experimentally induced (70%), including mostly situations in which participants completed tasks and got negative performance feedback that was attributable to discrimination because of situational cues, such as comments from confederates. The remaining effect sizes were obtained from stereotype threat situations before participants completed a task in a laboratory setting. Given their ethical and ecological restrictions, such direct experiences of discrimination in the laboratory may be somewhat artificial and in consequence less strong than mental health effects elicited in other paradigms. In salience induction paradigms, most studies (67%) used material such as text, images, video, or audio clips, or writing and quiz tasks to make negative stereotypes related to a participant's social identity salient and autobiographical recalls of situations in which participants felt discriminated against. This salience induction and reflecting on discriminatory instances from the past had clear effects on mental health. The descriptively strongest overall effect was found in vicarious experience paradigms that primarily involved studies in which participants imagined themselves in the situation of a member of their ingroup who experienced discrimination (42%) or read a text that itself discriminated against their social identity or included information about (pervasive) discrimination against their social identity (41%). The causal effects of salience induction and vicarious experience paradigms are particularly important because of their considerably high ecological validity, a result of using actual experiences (e.g., autobiographical recall) or real-world examples (often used in the texts, videos, etc. employed in the experiments). These effects underscore the adverse causal impact of discrimination on mental health that likely generalize to the effects of many day-to-day discrimination experiences.

Importantly, specific manipulation types (single-event vs. pervasive discrimination) tend to utilize certain research paradigms (direct experience, vicarious experience, saliency) more frequently than other paradigms. For example, direct experiences of discrimination are usually induced in single-event manipulations, not in pervasive manipulations. The question was whether certain combinations of manipulation type and research paradigm are

systematically more powerful in inducing negative mental health effects than others. We found that single-event studies inducing discrimination as a psychosocial stressor (compared to a neutral control or a nondiscriminatory stressor) showed mental health effects only when using salience induction and vicarious experience paradigms, not when direct experience paradigms were used. In contrast, manipulations in studies comparing attributions of discrimination to personal and external factors may not have been strong enough to elicit mental health effects compared to respective control groups, regardless of the use of different research paradigms. Of note, given the small number of effect sizes per research paradigm for pervasive discrimination manipulations, we could only examine the effects of studies using a vicarious experience paradigm. Clearly, pervasive manipulations using a vicarious research paradigm can reliably induce negative effects on mental health indicators.

Discrimination Types. We explored the effects of different types of discrimination on mental health using separate meta-analyses. These analyses revealed the most robust experimental effects for the discrimination types with the greatest number of effect sizes, specifically sexism and racism, that accounted for 42% and 27% of all effect sizes, respectively. Moreover, a large overall effect was found for heterosexism. No clear effect on mental health indicators was shown for ageism, body-related discrimination, status-related discrimination, or other forms of discrimination (e.g., religious discrimination or mental illness stigma)—potentially because of the limited number of effect sizes available for analysis. Interestingly, group status likely also contributes to the variation in overall effects of different discrimination types on mental health. Discrimination types with the most robust experimental evidence, namely sexism, racism, and heterosexism, were predominantly investigated in samples with respective marginalized identities, although discrimination types with the least robust overall effects, specifically body-related and status-related discrimination, were mainly examined in non-marginalized identity samples.

The descriptively largest effect was observed for heterosexism, a form of discrimination characterized by concealment, controllability, and social legitimization, all of which may contribute to stronger adverse mental health effects. Concealment can lead to additional stress and worse mental health outcomes owing to increased vigilance, threat of discovery, and impaired social relationships and support (Chaudoir et al., 2013; Pachankis, 2007). Additionally, heterosexist discrimination is often justified on the basis of controllability, leading to social legitimization of this form of discrimination, resulting in blame and internalization in affected individuals (Hansen & Sassenberg, 2011; Hatzenbuehler et al., 2009; Hegarty & Golden, 2008). This distinguishes heterosexism from other forms of discrimination, such as racism and sexism, that showed a robust but smaller overall mental health effect. Possible explanations include that racism and sexism might be less concealable and controllable, and racist and sexist discrimination is perceived as not as socially legitimized by the wider society (cf. Quinn & Earnshaw, 2013; Schmitt et al., 2014). A relevant limitation in interpreting these effect size differences is that there were substantially fewer effect sizes available for heterosexism (comprising 17 effect sizes from just two studies) compared to sexism (103 effect sizes from 38 studies) or racism (67 effect sizes from 26 studies). Yet, this trend of larger effect sizes for heterosexism ($r = -.28$) compared to sexism ($r = -.18$) and racism ($r = -.21$) was also observed in the correlational meta-analysis by Schmitt et al. (2014) that could include more effect sizes due to its focus on correlational evidence. Importantly, although the negative health effects of sexism and racism have received public attention, the negative effects of heterosexism on mental health might be underestimated. This is partially reflected in the notably fewer studies on this subject. To gain a better understanding of the gravity of heterosexism as a health problem, there is a pressing need for further research.

For ageism, which is also considered as not concealable and controllable but socially legitimized by the wider society, we found negative effects on mental health indicators that

approached significance. Further research is needed to explore the robustness of this finding, especially using more age-diverse samples (most studies in this meta-analysis examined young adults) and increasing power by synthesizing more research, once more studies become available over time. A similar argument can be made for body-related discrimination (in the included studies always operationalized as overweight-based discrimination). Body shape is less concealable but is considered highly controllable leading to the perception of body-related discrimination to be socially legitimized by the wider society and affected individuals (Puhl & Brownell, 2003). Nonetheless, the high proportion of non-marginalized participants (i.e., participants not affected by overweight) might have limited the power to detect potentially existing effects in the current meta-analysis. More diverse experimental research on these forms of discrimination is particularly relevant, given that correlational studies with diverse samples and a large number of available studies on age- or body-related stigma or discrimination show consistent negative findings for mental health (see, e.g., Emmer et al., 2020 and Chang et al., 2020, for systematic reviews) but the causal effects of these types of discrimination on mental health remain unclear.

Mental Health Outcomes. Interestingly, discrimination had medium to large effects in increasing other-directed externalizing (e.g., anger, hostility) and psychological-distress-related (e.g., psychological distress, negative affect) outcomes. Discrimination had no impact on positive well-being (e.g., positive affect, life satisfaction) or self-directed outcomes (e.g., self-esteem, shame). These causal findings are consistent with previous correlative evidence (Paradies et al., 2015; Schmitt et al., 2014). That discrimination immediately leads to other-related externalizing and psychological distress rather than internalizing responses (such as increased depression or low self-esteem) could hold important implications for social climate and society in general. When discrimination—including microaggressions—is considered as negative intergroup behavior, the link between aggressive behaviors as reaction to perceived discrimination potentially reinforces negative stereotypes associated with marginalized

groups, inadvertently validating the perpetrators' discrimination. Such a reinforcement cycle could lead to further marginalization and a deepening divide between groups. This can be seen on social media, where perceived discrimination can act as a catalyst for verbal aggression (English et al., 2020; Lewis et al., 2015) or political polarization (e.g., Yarchi et al., 2021). Addressing these patterns could be essential for fostering inclusivity, understanding, and positive social change.

Further, we did find a similar pattern of findings when examining single-event or pervasive manipulation separately – with one exception: Based on a limited number of studies, there are first signs that self-directed mental health outcomes (most often self-esteem) might be threatened by pervasive manipulations of discrimination. This effect can only be found in separate subgroup analysis of pervasive discrimination manipulations and are probably not visible in the overall analyses described above because most effect sizes stem from single-event manipulations. These findings need to be replicated in additional studies, nevertheless, they are interesting to follow up on because they have important theoretical and practical implications. Theoretically, this finding underlines that the self-protective functions of attributing and externalizing negative outcomes to discrimination, as postulated by the attributional ambiguity perspective, do not apply when discrimination is perceived as pervasive. This also reinforces the notion that marginalized groups affected by pervasive discrimination exhibit distinct mental health outcomes compared to non-marginalized individuals who may encounter rare and isolated instances of unfair treatment based on social identity but not pervasive discrimination. Thus, these marginalized groups emerge as exceptionally vulnerable, with discrimination posing a significant threat to their self-concept, just-world beliefs, and place in society.

Importantly, all mental health outcomes were assessed immediately after the manipulation and consisted mainly of acute measures of mental health states. In contrast, most theories do not focus on immediate mental health effects of discrimination, for example, the

extensive psychological mediation framework by Hatzenbuehler (2009) focuses on long-term effects and mechanisms. The framework describes that a marginalized identity represents a source of unique stressors and thus contributes directly to negative factors of mental health, namely, psychological distress and negative affect. The multimotive theory of rejection (Smart Richman & Leary, 2009) also focuses on motivated longer-term effects of a threatened need to belong in the face of discrimination but also includes immediate responses such as rejection-specific emotions (“hurt feelings”), a decrease in state self-esteem, and an increase in negative affect. Our results are generally in line with the multimotive theory as we found a trend for decreased self-directed outcomes—at least for pervasive forms of discrimination—that were assessed mainly with state self-esteem measures and found robust immediate effects on distress-related negative affect.

Within the framework of the social identity theory of collective action (van Zomeren et al., 2008), anger and hostility are conceptualized as outcomes of discrimination and seen as motivators for confrontation and social action. The theory of collective action proposes that pervasive discrimination is less likely to elicit action-oriented emotional responses such as anger. Our findings contrast with this theory because they suggest that both, pervasive and single-event manipulations lead to externalizing other-directed mental health outcomes. Given the small number of studies available for the effects of pervasive discrimination and externalizing outcomes, this finding needs to be interpreted with caution and needs to be replicated once more studies are published. Importantly, to our knowledge no theory addresses the immediate effect of discrimination on well-being-related outcomes—their focus appears to be on long-term effects of discrimination, not immediate responses.

Directionality of Effects

Does the experience of discrimination deteriorate mental health or do people with poorer mental health—particularly affect-related conditions such as depression or anxiety—perceive more discrimination (see, e.g., Lilienfeld, 2017)? Although this is an ongoing debate,

there is currently no substantial experimental research on poor mental health causing elevated discrimination perceptions. Nevertheless, we want to highlight potential pathways that emphasize this causal possibility in the following.

Two experimental studies by Cihangir et al. (2010) experimentally manipulated state self-esteem and tested it as a protective moderator. The results show that experimentally increased state self-esteem buffered the negative emotional, behavioral, and performance effects of discrimination, highlighting mental health as a resource in the face of discrimination. Importantly, we could not identify a single study that specifically investigated the effect of mental health on discrimination perceptions in an experimental design. Still, we want to emphasize hypervigilance as one possible pathway. Hypervigilance describes a state of increased alertness to threat stimuli and is a symptom of mental health conditions such as posttraumatic stress disorder and various types of anxiety disorders (American Psychiatric Association, 2022). In this state of increased alertness and arousal, discrimination stimuli could be identified more easily, increasing their pervasiveness amplifying the effects of discrimination. Further, individuals with a history of childhood maltreatment and samples with higher rates of posttraumatic stress disorders show higher detection sensitivity, resulting in faster identification of negative facial expressions and a negative bias toward neutral facial expressions (e.g., Bérubé et al., 2023; Masten et al., 2008). Hence, increased detection sensitivity to threat due to poorer mental health might also lead to increased perceptions of discrimination, especially in ambiguous situations. This can result in further increased vigilance and more frequent experiences of discrimination. Moreover, Sechrist et al. (2003) examined the effect of mood and showed that individuals in a negative mood showed an increased likelihood of reporting discrimination compared to participants with positive mood. Nonetheless, the empirical evidence for a mental health effect on discrimination perceptions is highly limited and the postulated pathways are purely speculative. Future research should investigate this direction of effect, as understanding the mechanisms by which mental health

affects perceptions of discrimination is crucial in preventing possible vicious cycles and thus adverse health effects.

Strengths and Limitations

This meta-analysis has several strengths. First, the comprehensive and systematic literature search enabled us to test overall causal effects of discrimination on mental health using a considerable number of studies, to examine what paradigms and manipulations are used in this area of research, and how they affect different facets of mental health. For example, our results indicate that more ecologically valid paradigms also led to stronger effects on mental health. Coding of the initial phase of the study selection and all data extraction from studies was conducted by two independent coders and achieved high interrater reliability. Second, all our methods and analyses are highly transparent and easy to replicate given our adherence to open science standards (a preregistered research protocol, publicly available extracted data, reproducible analysis scripts, and publicly available coding manuals). Further, we used a multilevel approach to extract as much available data as possible and model them in the most suitable way. Third, strict study selection criteria and several systematic methods for assessing the risk of bias and quality of evidence were used to evaluate the accuracy of the overall effect estimation.

This meta-analysis also has some limitations. For one, the samples in the studies included are mostly convenience samples limited in their variability on relevant sociodemographic characteristics such as education, gender, and age. This hindered our efforts to explore indicators for intersectional effects of discrimination, because further potentially disadvantaged social group identities could not be examined. The focus solely on discrimination related to one social identity might lead to additional underestimation of the mental health effects in this meta-analysis. Overall, most participants belong to rather privileged groups. This itself is an important result of this meta-analysis, as it underlines the strong need to include more diverse samples in experimental research on discrimination.

Second, despite a low risk of publication bias for the studies included in our meta-analysis and, thus, robust estimates, the overall quality of the studies included was rated as moderate. The moderate overall quality rating suggests that the true effect is likely close to the estimated effect, but the possibility remains that it is substantially different (Schünemann et al., 2013). The lowering of the overall quality rating was mostly due to a general downgrading of all studies due to selective samples—as discussed above—and high heterogeneity between effect sizes. On a similar note, although we contacted all authors who reported insufficient data in their studies to be included in the current meta-analysis, we only received 24% of the requested effect sizes and cannot assess whether the effect sizes we did not obtain systematically differ from the included effect sizes.

Third, experimental procedures always come with limitations. For instance, both ethical limitations as well as high control of lab-induced discrimination may not always accurately mirror real-world discrimination experiences. Our findings reflect this idea, because they indicate that the—arguably most controlled and artificial—discrimination induction, direct experience in the laboratory, was the least powerful in affecting mental health. Real autobiographical memories or real-world examples in text or image formats impacted mental health indicators much more strongly. Another experimental limitation is that some of the studies included did not check whether discrimination was successfully manipulated. Moreover, experimental studies manipulating discrimination are limited to assessing immediate effects. Hence, further research is needed to explore if experimental procedures can mimic how discriminatory experiences impact long-term mental health syndromes like depression or anxiety, using long-term follow-ups or experience sampling. Experience sampling could be particularly relevant because many forms of discrimination take place in the context of day-to-day events (e.g., English et al., 2020).

Fourth, substantial heterogeneity between effect sizes could only partially be explained by the proposed moderators and control variables. What other factors may be

contributing to the unexplained heterogeneity both between and within studies? Despite the focus on rather privileged groups, some studies examined highly specific samples, such as elderly persons of color with late-stage chronic kidney disease (Arriola et al., 2021) that differ significantly in various factors that influence the appraisal and coping with discrimination-related stressors. Heterogeneity within studies might arise from primary studies comparing discrimination effects among subsamples with contrasting levels of distinct psychological factors. Examples of these factors include self-efficacy (Hoyt & Blascovich, 2010), meritocracy beliefs (Major et al., 2007), or the intensity of exposure to discriminatory stimuli (Stroebe et al., 2010). By incorporating more diverse samples in primary studies, future meta-analyses could explore a broader variety of moderators, including participant demographics (age, gender, ethnic identity, education) and psychological factors (self-efficacy, worldviews, group identification). This could help elucidate the observed heterogeneity between and within studies and offer a fuller understanding of how individuals assess and manage discrimination-related stressors. Such insights could enhance the effectiveness of interventions.

Implications and Future Research

The findings of this meta-analysis have several theoretical implications. For one, further theoretical work is needed on specific mechanisms and outcomes within the attributional ambiguity perspective. In contrast to the attributional ambiguity perspective, we do not find attributions to discrimination less harmful to mental health than attributions to personal deservingness. Moreover, there is a need for theoretical and empirical research to investigate the mechanisms underlying why discrimination exerts a more immediate influence on externalizing and distress-related than well-being-related and self-directed outcomes. Such experimental research is also crucial for developing effective coping strategies and just-in-time adaptive interventions that have been rather overlooked so far.

This review also highlights the necessity of addressing specific methodological aspects in future experimental research, including protective factors that might mitigate the impact of discrimination on mental health, encompassing broader sample diversity, diverse forms of discrimination, variable settings, and validated diagnostic ratings by trained experts for psychopathology indicators. Although a basic exploration of the interaction among various person-related factors does not necessarily examine intersectional effects of discrimination on mental health, it can serve as an initial foundation for future research in identifying particularly vulnerable groups.

Further, experiments could profit from investigating the effects of pervasive discrimination in new life contexts. Social media, for example, are playing an increasingly prominent role in many people's lives (Ortiz-Ospina & Roser, 2019) and have become one of the contexts in which people regularly experience (cyber-)discrimination (English et al., 2020; Lewis et al., 2015). In the current meta-analysis, we identified just one experimental study on the effects of online discrimination. Also, only few experimental studies have examined discrimination in health care, interpersonal relationships, and political communication – all important areas of life that can be severely affected by discrimination (Pascoe & Smart Richman, 2009).

Last, more research is needed on the impact of different types of discrimination, different facets of mental health, and potential underlying mechanisms. The little experimental research available to date suggests that heterosexism might have a substantially larger effect on mental health than other forms of discrimination, yet more evidence is direly needed. To better understand how different forms of discrimination impact mental health, interindividual differences need to become a more central focus. In a recent meta-analysis (Emmer et al., 2020), weight self-stigma was more strongly related to mental health than public or structural weight stigma. This finding suggests that examining individual differences in internalization and other interindividual differences (e.g., appraisal of perceived

discrimination) might be promising to better understand how discrimination affects mental health. Complementary to experimental research, systematic reviews—including of qualitative studies—might provide important insights on this matter. Importantly, the theoretical and methodological implications described here are not independent of each other but need to be considered together to expand and further improve current theoretical frameworks on discrimination and mental health.

The present meta-analysis holds significant implications for policy and society. Given the recurring nature of discriminatory experiences in marginalized individuals' daily lives (English et al., 2020), it underscores the cumulative impact of discrimination on mental health. This pattern of discrimination occurs across the life span (Reskin, 2012) and its effects on mental health can even be transmitted across generations (Hankerson et al., 2022; Lugo-Candelas et al., 2021). Cumulative effects of discrimination could be a major threat to mental health, especially given that even small effects can have a significant impact on public health (e.g., Reinehr et al., 2016). However, despite personal and political efforts, it might be too idealistic to hope that one day, no person will be exposed to discrimination in any life context. Therefore, people who are particularly vulnerable need to receive support in dealing with experiences of discrimination. Specifically, given that social discrimination seems to have a much stronger immediate impact on externalizing and distress-related mental health than on positive and self-directed mental health outcomes, interventions should particularly target these negative mental health outcomes. Promising approaches to buffer discrimination-related stress might be values affirmation and sense of belonging interventions (see Lewis et al., 2015) or emotion regulation, which can mediate how discrimination impacts stress markers and psychopathology (Hatzenbuehler et al., 2009). This could be a promising target in empowerment and intervention programs. More generally, our results also highlight the importance of reducing cultural prejudice and, consequently, triggers and salience of stereotypes related to marginalized groups. One way to address this is by replacing

stigmatizing with inclusive language that can lead to a greater cognitive representation of marginalized groups and eventually reduce cultural prejudice and stereotypes (e.g., Braun et al., 2005; Chellappa, 2023). Moreover, the strong overall effect of vicarious discrimination experience on mental health found in this meta-analysis highlights the potential impact of exposure to discrimination experienced by others (see also Cheadle et al., 2020; Wofford et al., 2019, for similar findings on how vicarious discrimination experiences affect mental health, physiological stress responses, and social relationships).

Conclusion

This meta-analysis is the first to find that experimentally induced discrimination leads to impairments in mental health. This effect is stronger when discrimination is perceived as pervasive compared to a single, isolated event and might be more pronounced in populations with marginalized identities. The current analysis shows that the immediate adverse impact is considerably larger for externalizing and distress-related than for well-being and self-directed mental health outcomes. A better understanding of the moderators and mechanisms influencing the impact of discrimination could further advance this research and be the basis for effective interventions. Although the identified overall impact was small to moderate in size, several subgroup analyses showed also moderate to large effects. For example, the effect of heterosexism on mental health was large, as was the effect of discrimination in general on externalizing other-directed mental health outcomes. Of note, due to methodological limitations, the overall effect in this meta-analysis might be underestimated. The current findings reveal that discrimination harms mental health immediately and directly – and not only over the long-term and indirectly via disadvantages in various life domains such as employment or housing. Overall, the findings of this meta-analysis underscore the importance of considering the multiple ways in which discrimination can be experienced and induced in experimental settings and the potential differing effects on mental health outcomes. It

highlights the need for interventions and policies that address not only direct experiences of discrimination but also the salience of stereotypes and the impact of vicarious experiences.

Availability of data and materials

The preregistration, analysis code, and extracted data of this meta-analysis are available on the Open Science Framework: <https://osf.io/5fqa2/>. Additionally, the reproducible analysis script and respective data are openly accessible as community-augmented meta-analysis: <https://doi.org/10.23668/psycharchives.13933>.

Disclosure of Interest

The authors have no conflicts of interest to disclose.

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CRedit author statement

Christine Emmer played a lead role in conceptualization, data curation, formal analysis, investigation, methodology, project administration, supervision, validation, visualization, writing—original draft, and writing—review and editing. Julia Dorn played a lead role in writing—original draft and a supporting role in data curation and formal analysis. Jutta Mata played a lead role in conceptualization, funding acquisition, resources, supervision, writing—original draft, and writing—review and editing.

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Supplemental Material

Table S1.1

Full Search Strategies for all Databases

Search no.	Searches	Results
PsycINFO and PsycArticles (EBSCOhost) search strategy		
1	DE "Stigma" OR DE "Labeling" OR DE "Prejudice" OR DE "Stereotyped Attitudes" OR DE "Social Discrimination" OR DE "Racism" OR DE "Sexism" OR DE "Bullying" OR DE "Stranger Reactions" OR DE "Teasing" OR DE "Victimization" OR DE "Self-Stigma" OR DE "Hate Crimes" OR DE "Intersectionality" OR DE "Minority Stress" OR DE "Social Disadvantage" OR DE "Homosexuality (Attitudes Toward)" OR DE "Sex Discrimination" OR DE "Transgender (Attitudes Toward)" OR DE "Gender Role Attitudes" OR DE "AntiSemitism" OR DE "Religious Prejudices" OR DE "Racial and Ethnic Attitudes" OR DE "Race and Ethnic Discrimination" OR DE "Racial Bias" OR DE "Employment Discrimination" OR DE "Social Class Bias" OR DE "Obesity (Attitudes Toward)" OR DE "Disability Discrimination" OR DE "Ageism" OR DE "Age Discrimination" OR DE "Mental Health Stigma"	97,077
2	DE "Mental Health" OR DE "Well Being" OR DE "Life Satisfaction" OR DE "Stress" OR DE "Anxiety" OR DE "Distress" OR DE "Depression (Emotion)" OR DE "Self-Esteem" OR DE "Self-Worth" OR DE "Self-Efficacy" OR DE "Emotions" OR DE "Internalization" OR DE "Externalization" OR DE "Anger" OR DE "Fear" OR DE "Frustration" OR DE "Emotional States" OR DE "Negative Emotions" OR DE "Positive Emotions" OR DE "Adjustment" OR DE "Affective Disorders" OR DE "Mental Disorders" OR DE "Acute Stress" OR DE "Perceived Stress" OR DE "Psychological Stress" OR DE "Social Stress" OR DE "Stress Reactions"	707,038
3	S1 AND S2	18,316
4	AB ("experiment*" OR "trial" OR "quasi-experiment*" OR "field study" OR "lab study")	
5	S3 AND S4	1,098
6	S5 [Language: English and German; Population Group: Human]	1,055
PSYNDEX (EBSCOhost) search strategy		
1	DE "Stigma" OR DE "Labeling" OR DE "Prejudice" OR DE "Stereotyped Attitudes" OR DE "Social Discrimination" OR DE "Racism" OR DE "Sexism" OR DE "Bullying" OR DE "Stranger Reactions" OR DE "Teasing" OR DE "Victimization" OR DE "Self-Stigma" OR DE "Hate Crimes" OR DE "Intersectionality" OR DE "Minority Stress" OR DE "Social Disadvantage" OR DE "Homosexuality (Attitudes Toward)" OR DE "Sex Discrimination" OR DE "Transgender (Attitudes Toward)" OR DE "Gender Role Attitudes" OR DE "AntiSemitism" OR DE "Religious Prejudices" OR DE "Racial and Ethnic Attitudes" OR DE "Race and Ethnic Discrimination" OR DE "Racial Bias" OR DE "Employment Discrimination" OR DE "Social Class Bias" OR DE "Obesity (Attitudes Toward)" OR DE "Disability Discrimination" OR DE "Ageism" OR DE "Age Discrimination" OR DE "Mental Health Stigma"	10,424
2	DE "Mental Health" OR DE "Well Being" OR DE "Life Satisfaction" OR DE "Stress" OR DE "Anxiety" OR DE "Distress" OR DE "Depression (Emotion)" OR DE "Self-Esteem" OR DE "Self-Worth" OR DE "Self-Efficacy" OR DE "Emotions" OR DE "Internalization" OR DE "Externalization" OR DE "Anger" OR DE "Fear" OR DE "Frustration" AND DE "Emotional States" OR DE "Negative Emotions" OR DE "Positive Emotions" OR DE "Adjustment" OR DE "Affective Disorders" OR DE "Mental Disorders" OR DE "Acute Stress" OR DE "Perceived Stress" OR DE "Psychological Stress" OR DE "Social Stress" OR DE "Stress Reactions"	54,784
3	S1 AND S2	1,345
4	[Methodology: experimental study]	
5	S3 AND S4	76
6	S5 [Language: English and German]	76
Web of Science/Social Sciences Citation Index (Clarivate Analytics) search strategy		
1	TI = ("*stigma*" OR "labeling" OR "prejudice*" OR "stereotype*" OR "discriminat*" OR "unfair treatment" OR "bias*" OR "rejection" OR "*aggression*" OR "devaluation" OR "racism" OR "sexism" OR "discounting" OR "teasing" OR "bullying" OR "victimization" OR "hate crimes" OR "intersectionality" OR "minority stress" OR "social disadvantage" OR "homophobia" OR "anti-gay" OR "sexual orientation" OR "transgender" OR "gender role attitudes" OR "antisemitism" OR "anti-muslim" OR "ageism" OR "ableism")	131,734
2	TI = ("mental health" OR "psychological health" OR "well being" OR "well-being" OR "coping" OR "life satisfaction" OR "happiness" OR "*stress*" OR "self-esteem" OR "self-efficacy" OR "anger" OR "depress*" OR "sadness" OR "anxiety" OR "affect*" OR "mood" OR "internalizing" OR "externalizing" OR "self-worth" OR "adjustment" OR "emotion*" OR "mental disorders")	598,187
3	S1 AND S2	15,119

Search no.	Searches	Results
4	CATEGORIES: (PSYCHOLOGY EXPERIMENTAL)	
5	S3 AND S4	960
6	S5 [Language: English or German]	959
Sociological Abstracts and Dissertation & Theses Global (ProQuest) search strategy		
1	MAINSUBJECT.EXACT (“Discrimination” OR “Stigma” OR “Labeling” OR “Prejudice” OR “Stereotypes” OR “Racism” OR “Sexism” OR “Aggression” OR “Victimization” OR “Rejection” OR “Bias” OR “Hate Crime” OR “Minority Groups” OR “Aggression” OR “Sex Stereotypes” OR “Misogyny” OR “Heterosexism” OR “Homophobia” OR “Classism” OR “Employment Discrimination” OR “Ageism” OR “Anti-Semitism”)	115,963
2	MAINSUBJECT.EXACT (“Mental Health” OR “Well Being” OR “Life Satisfaction” OR “Psychological Distress” OR “Empowerment” OR “Stress” OR “Anxiety” OR “Depression (Psychology)” OR “Self Esteem” OR “Emotions” OR “Internalization” OR “Happiness” OR “Frustration” OR “Adjustment” OR “Emotions” OR “Fear” OR “Psychological Stress” OR “Affective Illness” OR “Anger” OR “Psychological Distress”)	150,525
3	S1 AND S2	12,472
4	AB (“experiment*” OR “trial” OR “quasi-experiment*” OR “field study” OR “lab study”)	
5	S3 AND S4	655
6	S5 [Language: English or German]	640
Academic Search Premier (EBSCOhost) search strategy		
1	DE “PERCEIVED discrimination” OR DE “SOCIAL stigma” OR DE “PREJUDICES” OR DE “AGGRESSION (Psychology)” OR DE “STIGMATIZATION” OR DE “STEREOTYPES” OR DE “STEREOTYPES” OR DE “OTHERING” OR DE “INTERSECTIONALITY” OR DE “MINORITIES” OR DE “BULLYING” OR DE “DISCRIMINATION (Sociology)” OR DE “AGE discrimination” OR DE “AIDS phobia” OR DE “APPEARANCE discrimination” OR DE “BIPHOBIA” OR DE “CASTE discrimination” OR DE “COVERT discrimination” OR DE “DISCRIMINATION against caregivers” OR DE “DISCRIMINATION against people with AIDS” OR DE “DISCRIMINATION against people with disabilities” OR DE “DISCRIMINATION against people with mental illness” OR DE “DISCRIMINATION against the homeless” OR DE “DISCRIMINATION against unmarried couples” OR DE “DISCRIMINATION in banking” OR DE “DISCRIMINATION in capital punishment” OR DE “DISCRIMINATION in education” OR DE “DISCRIMINATION in financial services” OR DE “DISCRIMINATION in insurance” OR DE “DISCRIMINATION in justice administration” OR DE “DISCRIMINATION in law enforcement” OR DE “DISCRIMINATION in medical care” OR DE “DISCRIMINATION in mental health services” OR DE “DISCRIMINATION in municipal services” OR DE “DISCRIMINATION in public accommodations” OR DE “DISCRIMINATION in restaurants” OR DE “DISCRIMINATION in sports” OR DE “DISCRIMINATION in taxation” OR DE “DISCRIMINATION in the advertising industry” OR DE “DISCRIMINATORY language” OR DE “EMPLOYMENT discrimination” OR DE “EROTOPHOBIA” OR DE “ETHNIC discrimination” OR DE “HOMOPHOBIA” OR DE “HOUSING discrimination” OR DE “INDIRECT discrimination” OR DE “MICROAGGRESSIONS” OR DE “RACE discrimination” OR DE “RELIGIOUS discrimination” OR DE “REVERSE discrimination” OR DE “SEGREGATION” OR DE “SEX discrimination” OR DE “SPECIESISM” OR DE “TOKENISM” OR DE “TRANSPHOBIA” OR DE “DISCRIMINATION against overweight persons” OR DE “DISCRIMINATION in higher education” OR DE “SEX discrimination in education” OR DE “SEX discrimination in employment” OR DE “PREJUDICES” OR DE “ABLEISM” OR DE “AGEISM” OR DE “ANTI-Americanism” OR DE “ANTI-Arabism” OR DE “ANTI-Asian racism” OR DE “ANTI-Catholicism” OR DE “ANTI-Japanism” OR DE “ANTI-Mormonism” OR DE “ANTISEMITISM” OR DE “BIAS (Law)” OR DE “CLASSISM” OR DE “COLORISM” OR DE “CULTURAL prejudices” OR DE “ETHNOCENTRISM” OR DE “GENDERISM” OR DE “ISLAMOPHOBIA” OR DE “NATIVISM” OR DE “RACISM” OR DE “SEXISM” OR DE “ABLEISM” OR DE “AGEISM” OR DE “HOMOPHOBIA” OR DE “ATTITUDES toward homosexuality” OR DE “XENOPHOBIA” OR DE “DISCRIMINATION -- Religious aspects”	187,053
2	DE “EMOTIONS” OR DE “AFFECT (Psychology)” OR DE “MENTAL health” OR DE “SELF-esteem” OR DE “SELF-efficacy” OR DE “EXTERNALIZATION (Psychology)” OR DE “PSYCHOLOGICAL well-being” OR DE “ANGER” OR DE “FEAR” OR DE “PSYCHOLOGICAL adaptation” OR DE “AFFECTIVE disorders” OR DE “MENTAL illness” OR DE “PSYCHOLOGICAL stress” OR DE “ACUTE stress disorder” OR DE “ANXIETY” OR DE “FRUSTRATION” OR DE “PSYCHOLOGICAL stress -- Research” OR DE “HAPPINESS”	426,000
3	S1 AND S2	15,422
4	AB (“experiment*” OR “trial” OR “quasi-experiment*” OR “field study” OR “lab study”)	
5	S3 AND S4	897

Search no.	Searches	Results
6	S5 [Language: English, German]	882
PsyArXiv and SocArXiv (OSFPREPRINTS) search strategy		
1	<p>title: (“*stigma*” OR “attitude*” OR “labelling” OR “prejudice*” OR “stereotyp*” OR “discriminat*” OR “unfair treatment” OR “rejection” OR “bias*” OR “teasing” OR “bullying” OR “victimization” OR “racism” OR “sexism” OR “aggression” OR “devaluation” OR “hate crimes” OR “intersectionality” OR “minority stress” OR “social disadvantage” OR “homophobia” OR “anti-gay” OR “sexual orientation” OR “transgender” OR “gender role attitudes” OR “antisemitism” OR “anti-muslim” OR “ageism” OR “ableism”) AND (“mental health” OR “well being” OR “well-being” OR “life satisfaction” OR “quality of life” OR “stress*” OR “self-esteem” OR “self-efficacy” OR “depress*” OR “anxiety” OR “psychological health” OR “coping” OR “mood” OR “affect*” OR “happiness” OR “anger” OR “sadness” OR “internalizing” OR “externalizing” OR “self-worth” OR “adjustment” OR “emotion*” OR “mental disorders”)</p> <p>AND (“experiment*” OR “trial” OR “quasi-experiment*” OR “field study” OR “lab study”)</p> <p>[Active Filters: PsyArXiv, SocArXiv]</p>	107

Note. DE = descriptors (specific subject terms); S = search; AB = abstract; TI = title.

Table S1.2
Coding Manual

Variable	Coding system
Block 1: Study	
General information	
Date form completed [date]	Write down the date you completed the form (<i>dd/mm/yyyy</i>)
ID of person extracting data [coderID]	Name or ID (e.g., initials) of the person extracting the data
Study characteristics	
Manuscript ID [manuscriptID]	Assign a unique identification number to each manuscript (1, 2, 3, 4, etc.)
Bibliographic reference [citat]	Complete citation in APA form
Author [author]	Name of the (first) author of the paper (e.g., “Schmitt et al.” or “Brownell”)
Year [year]	Year of publication. If two separate records are being used to code a single study, code the more formally published record's publication year
Type of publication [pubtype]	Specify what type of publication the study is: 1 = Journal article 2 = Doctoral dissertation 3 = Thesis 4 = Book or book chapter 5 = Conference paper 6 = Technical report 7 = Preprint 8 = Other (specify)
Notes [notes1]	Notes and comments about Block 1. If any peculiarities, other interesting aspects, or ambiguities in the data extraction have occurred, please specify
Block 2: Experiment	
Study ID [studyID]	Assign a unique ID to each experiment. If multiple experiments are reported, each gets its own new ID and line in the coding scheme
Study design [design]	Specify the research design of the study in terms of the data that make up the effect size 1 = Semiexperimental (e.g., field experiment, quasiexperiment) 2 = Experimental (experiment with random assignment) 3 = Experimental but random assignment not explicitly mentioned 4 = Other (e.g., combination of longitudinal and experimental, etc.)
Study quality	Please familiarize yourself with the document “DIAD_Supplement” for information on the assessment of the following study-quality questions
Fit between concepts and operations: Intervention [fit_intervention]	Were the participants treated in a way that is consistent with the definition of the intervention? 1 = Yes vs. 0 = No NA = Unknown/Not applicable
Fit between concepts and operations: Outcome measure [fit_outcome]	Were the outcomes measured in a way that is consistent with the proposed effects of the intervention? 1 = Yes vs. 0 = No NA = Unknown/Not applicable
Clarity of causal inference: Fair comparison [inference_comparison]	Were the participants in the group receiving the intervention comparable to the participants in the comparison group? 1 = Yes vs. 0 = No NA = Unknown/Not applicable
Generality of findings: Inclusive sampling [generality_sample]	Did the sample contain participants with the necessary characteristics to be considered part of the target population? 1 = Yes vs. 0 = No NA = Unknown/Not applicable
Precision of outcome estimation: Effect sizes and standard errors [precision_effect]	Were effect sizes and their standard errors accurately estimated? 1 = Yes vs. 0 = No NA = Unknown/Not applicable
Precision of outcome estimation: Statistical reporting [precision_reporting]	Were the statistical tests adequately reported? 1 = Yes vs. 0 = No NA = Unknown/Not applicable
Study quality [quality]	Overall DIAD score (count the number of “Yes,” 0 to 6)
Notes [notes2]	Notes and comments about Block 2. If any peculiarities, other interesting aspects, or ambiguities in the data extraction have occurred, please specify

Variable	Coding system
Block 3: Sample	
Sample ID [sampleID]	Assign a unique ID to each (sub)sample. If one study examines multiple (sub)samples, each gets its own new number and line in the coding scheme
Sample size [n]	Number of subjects/participants
Region of data collection [region]	Please name the region where the data collection took place (e.g., North America, Europe) 1 = North America 2 = Australia 3 = Europe 4 = Asia 5 = Other
Age group of the sample [ageGROUP]	Specify the age group of the sample: 1 = Infants (0–2) 2 = Children (2–12) 3 = Adolescents (13–17) 4 = Young adults (18–25) 5 = Adults (25–65) 6 = Older adults (65+) 7 = Mixed, cannot tell
Mean age of sample [age]	Specify the approximate or exact mean age of the total sample. Code the best information available; estimate mean age from grade levels if necessary
Predominant sex of sample [sex]	Write the % of participants who self-identified as female/woman in the sample. If nonbinary or transgender was assessed, provide detailed information
Predominant ethnicity of sample [ethnicityWHITE]	Write the % of participants who self-identified as White in the sample
Ethnicity of participants [ethnicity]	Write the reported information about the ethnicities (e.g., Latinx) of the sample
Education [education]	Write the reported information about the education level of the sample
Education classified [eduCLASS]	Categorize the education level of the sample data into groups that apply to more than 50% of the individuals: 1 = Low education (ISCED 0–2; the typical cumulative duration is 9 years but may range from 8 to 11 years) 2 = Medium education (ISCED 3–4; 11–14 years of education) 3 = High education (ISCED 5–8; > 14 years of education) 4 = University students 5 = Pupils 6 = Less than 50% of participants within a certain category
Coping strategies [coping]	If available, write a brief description or give details of the definition and measurement of examined coping strategies used
Group status [groupstatus]	Relative status of the ingroup targeted by discrimination. Please classify group status as marginalized when the sample possessed a social identity that is historically marginalized and subject to the induced discrimination type in the study. For example, when discrimination type is sexism, samples including participants identifying as men should be categorized as non-marginalized, samples including participants identifying as women as marginalized, and samples including men and women as “mixed group status”; when samples include participants identifying as men and a marginalized identity (e.g., being part of an ethnic minority), the classification of the sample is non-marginalized. All samples from studies on discrimination targeting non-marginalized identities, such as specific university study majors, should be classified as non-marginalized. 1 = Historically relatively disadvantaged, marginalized identity 2 = Historically more advantaged, non-marginalized identity 3 = Mixed group status in the sample (participants with marginalized and participants without marginalized identity)
Notes [notes3]	Notes and comments about Block 3. If any peculiarities, other interesting aspects, or ambiguities in the data extraction have occurred, please specify

Variable	Coding system
Block 4: Effect size	
Effect size ID [esID]	Assign each effect size within a study its unique number. Number multiple effect sizes within a study sequentially, e.g., 1, 2, 3, 4, etc.; each gets its own ID and line in the coding scheme
Source of effect size [esPAGE]	Page number where the data for this effect size were found; please mark the location in the PDF document of the study
Mean of treatment group [treatment_MEAN]	Mean of the mental health outcome of the treatment (discriminated against) group (posttreatment)
Standard deviation of treatment group [treatment_SD]	Standard deviation of the mental health outcome of the treatment (= discriminated against) group (posttreatment)
Size of treatment group [treatment_N]	Sample size of the treatment (= discriminated against) group
Mean of control group [control_MEAN]	Mean of the mental health outcome of the control group (posttreatment)
Standard deviation of control group [control_SD]	Standard deviation of the mental health outcome of the control group (posttreatment)
Size of control group [control_N]	Sample size of the control group
<i>F</i> value [F]	<i>F</i> value of the comparison of the treatment and the control group (<i>df</i> for the numerator must equal 1)
<i>t</i> value [t]	<i>t</i> value of the comparison of the treatment and the control group
<i>p</i> value [p]	<i>p</i> value of Cohen's <i>d</i> or of the information used to calculate <i>d</i>
Effect size [d]	Cohen's <i>d</i> of the effect of discrimination on mental health outcome. If no Cohen's <i>d</i> coefficient is reported, specify the information in the next items and type NA in this item
Computed <i>d</i> [comp_d]	Please calculate <i>d</i> with the available information and the Practical Meta-Analysis Effect Size Calculator: https://campbellcollaboration.org/research-resources/effect-size-calculator.html Always report the direction of the discrimination effect (e.g., if discrimination leads to a lower score of the dependent variable, <i>d</i> needs to be negative). If the only available information is that there was no significant effect, please type "0" and report it in variable [nonsign]
Lower limit of <i>d</i> confidence interval [CI_lower]	Lower limit of the 95% confidence interval (CI) of <i>d</i> . If no CI is reported, please use the information provided by the Practical Meta-Analysis Effect Size Calculator
Upper limit of <i>d</i> confidence interval [CI_upper]	Upper limit of the 95% confidence interval (CI) of <i>d</i> . If no CI is reported, please use the information provided by the Practical Meta-Analysis Effect Size Calculator
Variance of <i>d</i> [v]	Variance of <i>d</i> . If no variance is reported, please use the information provided by the Practical Meta-Analysis Effect Size Calculator
Type of information to compute <i>d</i> [info_dTYPE]	If there is a Cohen's <i>d</i> coefficient reported in the last item type NA; if the bivariate relationship between the variables is not specified with Cohen's <i>d</i> in the previous item, specify what information you used to calculate <i>d</i> . Please use the following list for your description: 1 = Means and standard deviations 2 = <i>t</i> test 3 = <i>F</i> test (2 groups) 4 = <i>p</i> value 5 = <i>r</i> (correlation coefficient) 6 = Other (specify in the next item)
Description of other information [other_d]	If you answered "6" in the previous item, please describe the information used to calculate <i>d</i>
Confidence rating in effect size computation [conf_d]	Please rate your confidence in the effect size computation: 1 = Highly estimated (have <i>N</i> and crude <i>p</i> value only, e.g., $p < .10$, or other limited information) 2 = Some estimation (have complex but complete statistics, some uncertainty about precision or accuracy of information) 3 = Slight estimation (must use significance testing statistics rather than descriptive statistics but have complete statistics of conventional sort, e.g., <i>t</i> or <i>F</i> value) 4 = No estimation (have descriptive data such as means, standard deviations, etc. and can calculate the effect size directly)
Built means [means]	If you built means from control/experimental (sub)groups, please give more information here

Variable	Coding system
Discrimination	
Categorized independent variable [ivDOMAIN]	Assign the independent variable to one of the intergroup contexts of discrimination: 1 = Sexism 2 = Racism 3 = Body-related discrimination (e.g., weight) 4 = Status-related discrimination (e.g., academic identities) 5 = Ageism 6 = Heterosexism 7 = Other (specify in the next item)
Description of other information [other_ivDOMAIN]	If you answered “7” in the previous item, please describe the type of discrimination
Setting of discrimination manipulation [ivSETTING]	Describe the social setting in which discrimination is manipulated: 1 = Employment 2 = Education/university 3 = Health care 4 = Interpersonal relationships 5 = (Social) Media 6 = Overall/in general/in everyday life 7 = Other (specify in the next item)
Description of other information [other_ivSETTING]	If you answered “7” in the previous item, please describe the setting
Manipulation type [ivTYPE_info]	Describe in full detail how discrimination was manipulated and what comparison was used. Use the following categories to guide your answer, but give detailed information on the manipulation and context here (indicate the category in the next item): Single-event discrimination: negative outcome with attribution to discrimination vs. 1 = Personal attribution 2 = External attribution Single-event discrimination: discrimination stressor vs. 3 = Neutral control condition 4 = Nondiscriminatory other stressor Pervasive discrimination against the ingroup vs. 5 = Single-event, rare, and isolated discrimination against the ingroup 6 = Pervasive discrimination against an outgroup 7 = Neutral control condition Other 8 = Other single event 9 = Other pervasive discrimination 10 = Other
Type of discrimination manipulation [ivTYPE]	Categorize the type of discrimination manipulation that was examined in this study (if necessary, give a more details in the next item): 1 = Single-event attribution to discrimination vs. personal 2 = Single-event attribution to discrimination vs. external 3 = Single-event discrimination vs. neutral control condition 4 = Single-event discrimination vs. other stressor 5 = Pervasive discrimination vs. single event 6 = Pervasive discrimination against ingroup vs. against outgroup 7 = Pervasive discrimination vs. neutral control condition 8 = Other single-event discrimination 9 = Other pervasive discrimination 10 = Other
Description of other information [other_ivTYPE]	If you answered “other” (8, 9, 10) in the previous item, please describe the discrimination manipulation type
Research paradigm [paradigm]	Categorize the research paradigm that was utilized to induce discrimination (if necessary, give more details in the next item): Direct experience paradigms 1 = Experiencing an event 2 = Task performance after induction of stereotype threat Salience induction paradigms 3 = Autobiographical recall 4 = Make general stereotypes toward one’s group salient Vicarious experience paradigms 5 = Imagination

Variable	Coding system
	<ul style="list-style-type: none"> 6 = Reading text 7 = Viewing images/pictures 8 = Watching video clip 9 = Hearing audio clip 10 = Mixed (specify in the next item)
Description of research paradigm [paradigm_info]	If necessary, give more information on the research paradigm here
Type of exposure [exposure]	Describe the type of exposure: 1 = Actual or real-life exposure 2 = Imagined or scenario exposure
Target of discrimination [target]	Describe the target of induced discrimination. Please use the following list for your description: Personal discrimination <ul style="list-style-type: none"> 1 = Single-event study with negative feedback (e.g., test performance, not selected for a job/team) 2 = Single-event study with (micro-)aggression (verbal or physical); experiencing or imagining discriminatory events directed toward the self Group-level discrimination <ul style="list-style-type: none"> 3 = Single-event study with vicarious discrimination (e.g., read a vignette about a discriminatory event experienced by one individual of the ingroup) 4 = Pervasive discrimination against the ingroup 5 = Stereotype threat or activation Other <ul style="list-style-type: none"> 6 = Other (specify in the next item)
Description of other information [other_target]	If you answered “6” in the previous item, please describe the target of induced discrimination
Description of all manipulation checks [ivCHECK_info]	Describe all reported manipulation check(s) in detail
Description of discrimination-related manipulation checks [ivCHECK_content_info]	Give a brief summary or categorization of the manipulation checks used that relate to the experimental induction of discrimination compared to the control group (e.g., attributions to discrimination, perceived extent of prejudice, or salience of stereotype). Type “not reported” if none was reported
Discrimination-related manipulation check [ivCHECK]	Indicate whether a significant discrimination-related manipulation check was 1 = Reported vs. 0 = Not reported
Description of participation-related manipulation check [ivCHECK_participation_info]	Give a brief summary or categorization of the manipulation checks used that relate to the participation of individuals (e.g., suspicion probe, attention or comprehension checks, or compliance with instructions). Type “not reported” if none was reported
Participation-related manipulation check [ivCHECK_participation]	Indicate whether a significant participation-related manipulation check was 1 = Reported vs. 0 = Not reported
Mental health outcome	
Time elapsed [time]	Report all information on the time elapsed between the experimental procedures and the assessment of mental health
Categorized outcome variable [dvDOMAIN]	Assign the outcome variable to one of the groups of different mental health outcomes: <ul style="list-style-type: none"> 1 = Self-esteem 2 = Well-being and quality of life/life satisfaction 3 = Depressed affect 4 = Anxiety 5 = Psychological distress 6 = Positive affect/mood 7 = Negative affect/mood 8 = Externally directed negative emotions (e.g., anger, hostility) 9 = Self-/internally directed negative emotions (e.g., shame, guilt) 10 = Other (specify in the next item)
Description of other information [other_dvDOMAIN]	If you answered “10” in the previous item, please describe the mental health outcome type
Measurement of the outcome [dvMEASURE]	Describe the method (questionnaire, scale, etc.) by which mental health was measured

Variable	Coding system
Measurement type of the outcome [dvTYPE]	Categorize the type of measurement being performed on the outcome: 1 = Acute, short-term, and immediate changes in mental health states or symptoms 2 = Chronic, long-term, and persistent mental health outcomes 3 = Other (specify)
Notes [notes4]	Notes and comments about Block 4. If any peculiarities or ambiguities in the extraction of the data have occurred, please specify

Note. Missing values were coded as NA (not available). The names of the variables are written in brackets [VARIABLE NAME]. ISCED = International Standard Classification of Education (UNESCO Institute for Statistics, 2012).

Table S1.3
Intercoder Reliability for Extracted Data

Variable (measurement level)	Cases (<i>N</i>)	Krippendorff's α	Percentage agreement
Study level	73		
Publication year (interval)		1.00	97.3%
Experiment level	93		
Study quality			
Fit intervention (nominal)		1.00	100%
Fit outcome (nominal)		0.80	92.5%
Inference comparison (nominal)		0.70	84.9%
Generality sample (nominal)		1.00	100%
Precision effect (nominal)		1.00	100%
Precision reporting (nominal)		0.82	91.4%
Sample level	117		
Sample size (interval)		0.99	97.4% ^a
Group status (nominal)		0.98	99.1%
Age (interval)		1.00	100% ^a
Gender ratio (interval)		0.99	98.2% ^a
Education level (nominal)		0.87	95.6%
Ethnicity (interval)		1.00	95.0% ^a
Coping strategy (nominal)		Undefined ^b	Undefined ^b
Effect-size level	245		
Effect size <i>d</i> (interval)		0.98	97.9% ^c
Discrimination type (nominal)		0.99	99.6%
Social setting (nominal)		0.86	89.8%
Manipulation type (nominal)		0.89	92.2%
Manipulation check (nominal)		0.93	96.3%
Research paradigm (nominal)		0.88	89.8%
Mental health outcome (nominal)		0.98	98.0%

Note. Two coders independently extracted the data from primary studies.

^a An extended percentage agreement (tolerance) of 1% was used (i.e., scores that differ by 1% are interpreted as agreeing), because different formulas to calculate and round the values were used.

^b Because no data for coping strategies were available, Krippendorff's α and percentage agreement are undefined for this variable.

Table S1.4

Assessment of Methodological Quality of Primary Experiments

1.1. Fit between concepts and operations: Intervention

Were the participants treated in a way that is consistent with the definition of the intervention?

[Decisions for responses in a study with multiple interventions are based on majority decisions with $\geq 70\%$ for “yes”]

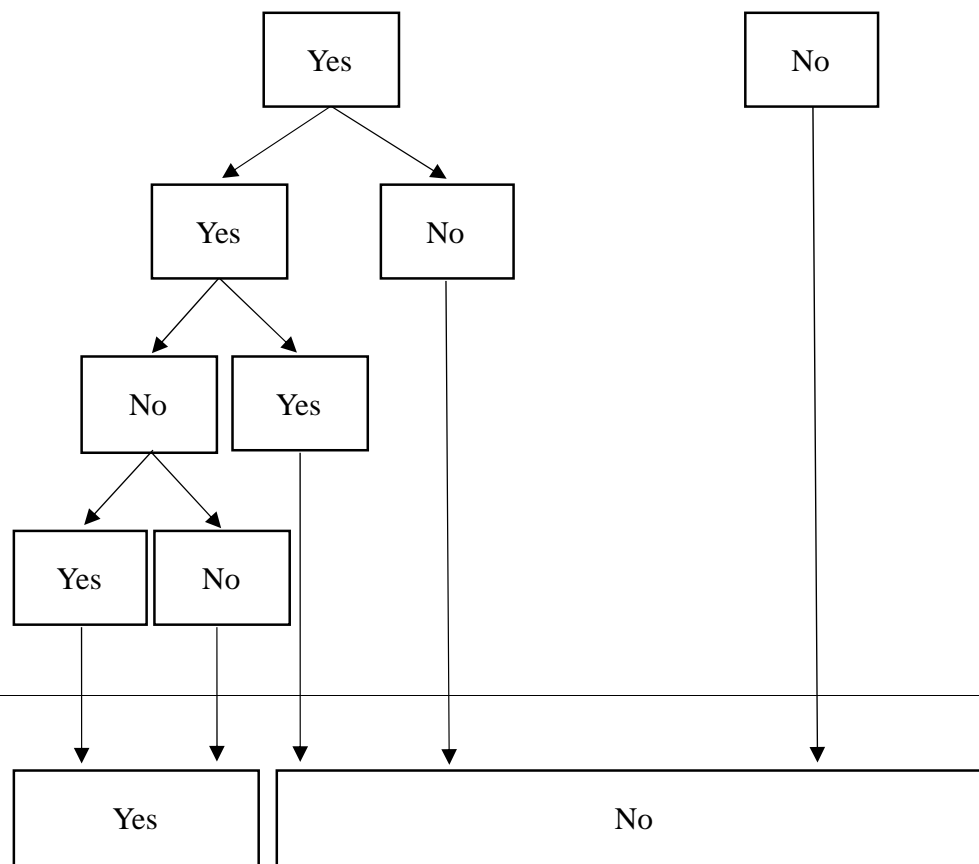
1.1.1. Does the intervention reflect commonly held or theoretically derived characteristics about what it should contain?

The intervention should induce discrimination through unfair treatment, social rejection based on social group membership, stereotype activation or threat, or attribution of negative events to discrimination.

1.1.2. Was the intervention described at a level of detail that would allow its replication by other implementers?

1.1.3. Was there evidence that the group receiving the intervention might also have experienced a changed expectancy, novelty, and/or disruption effect not also experienced by the control group (or vice versa)?

1.1.4 Was there evidence that the intervention was implemented in a manner similar to the way it was defined?



1.2. Fit between concepts and operations: Outcome measure

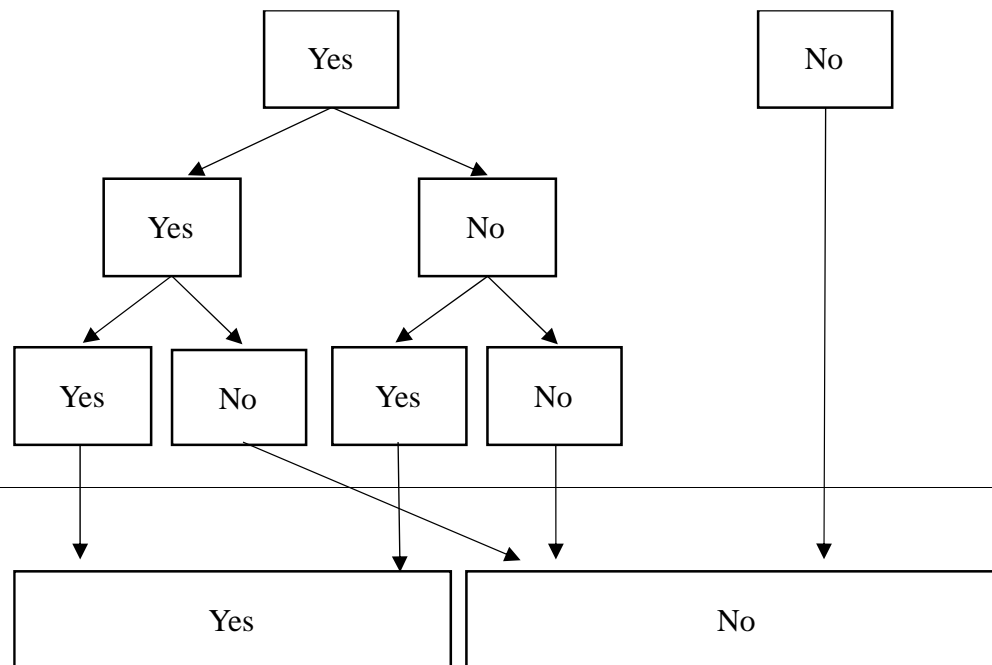
Were the outcomes measured in a way that is consistent with the proposed effects of the intervention?

[Decisions for responses in a study with multiple outcome measures are based on majority decisions with $\geq 50\%$ for “yes”]

1.2.1. Do items on the outcome measure appear to represent the content of interest?

1.2.2. Were the scores on the outcome measure acceptably reliable (e.g., Cronbach’s $\alpha \geq .70$)?

1.2.3. Was the outcome measure properly aligned to the intervention condition?



Evaluation of the response pattern:

2.1. Clarity of causal inference: Fair comparison

Were the participants in the group receiving the intervention comparable to the participants in the comparison group?

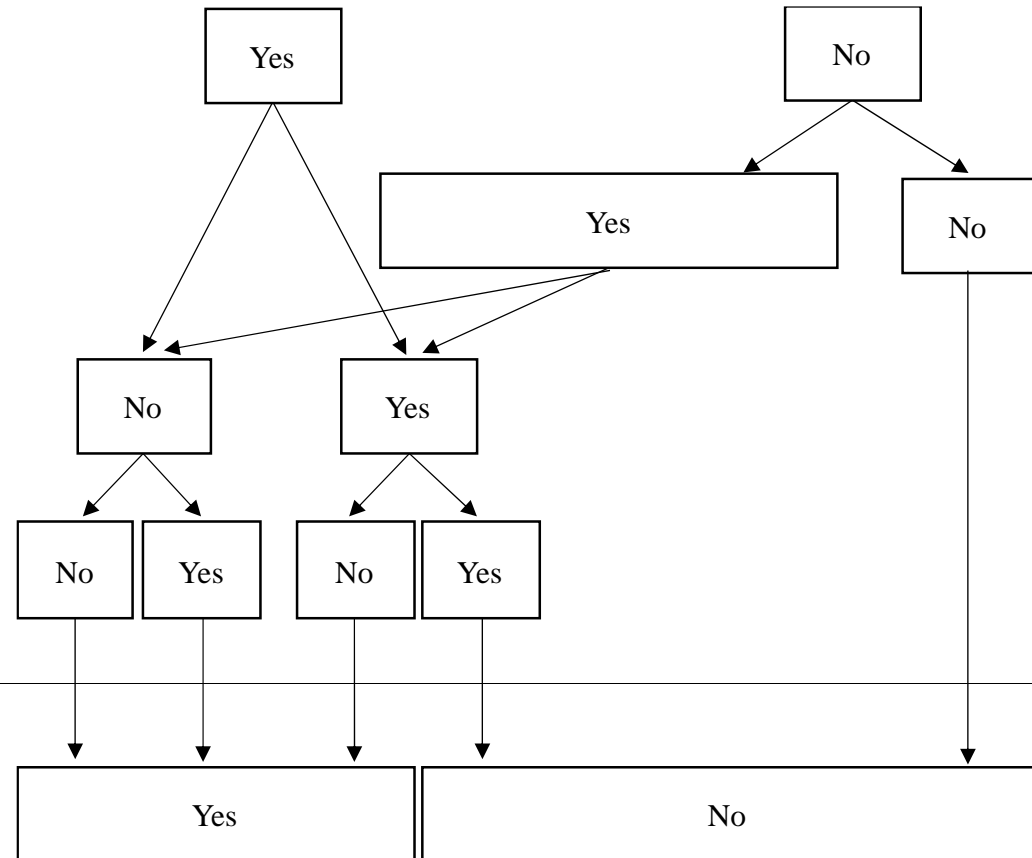
[Decisions for responses in a study with multiple comparisons are based on majority decisions with $\geq 70\%$ for “yes”]

2.1.1. Was random assignment used to place participants into conditions? (If yes, skip the next question)

2.1.2. For quasiexperiments: Were adequate equating procedures used to recreate the selection model?

2.1.3. Was there differential attrition between intervention and comparison groups (i.e., > 10% dropout in one group in relation to the other)?

2.1.4. Was there severe attrition overall (i.e., > 20% dropout in total)?



Evaluation of the response pattern:

3.1. Generality of findings: Inclusive sampling

Did the study include variation on participants, settings, outcomes, and occasions representative of the intended beneficiaries?
 [Decisions for responses in a study with multiple comparisons are based on majority decisions with $\geq 50\%$ for “yes”]

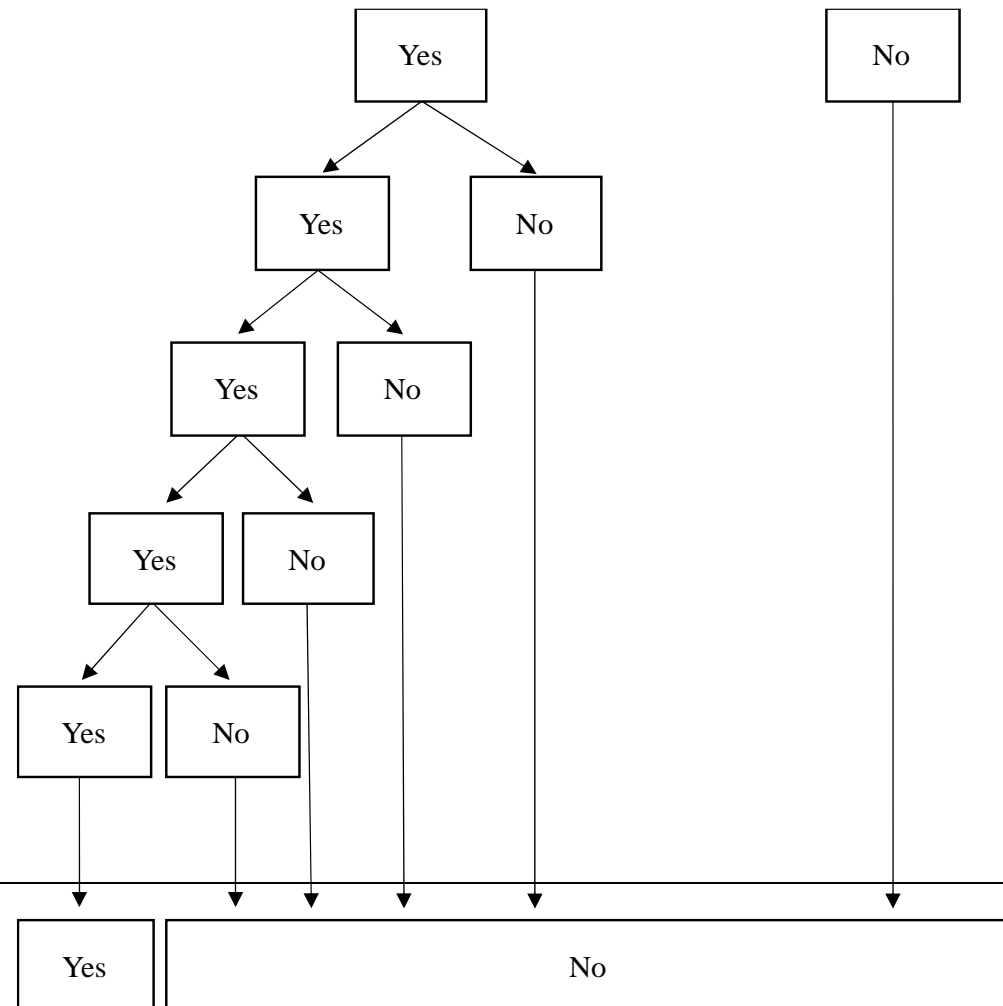
3.1.1. Did the sample contain participants with the necessary characteristics to be considered part of the target population?
 The decision is based on the definition of discrimination as an aspect of stigma: requires at least one sample with marginalized or mixed group status.

3.1.2. To what extent did the sample capture variation among participants on important characteristics of the target population?
 The decision is based on the sampling strategy: requires probability sampling or in case of nonprobability sampling a comparable distribution of factors such as age, gender or ethnic identity, or socioeconomic status to relevant surveys of the subgroup.

3.1.4. To what extent were important classes of outcome measures included in the study?

3.1.5. Did the study measure the outcome at a time appropriate for capturing the intervention's effect?

3.1.6. Was the study conducted during the time frame appropriate for extrapolating to current conditions?



Evaluation of the response pattern:



4.1. Precision of outcome estimation: Effect sizes and standard errors

Were effect sizes and their standard errors accurately estimated?

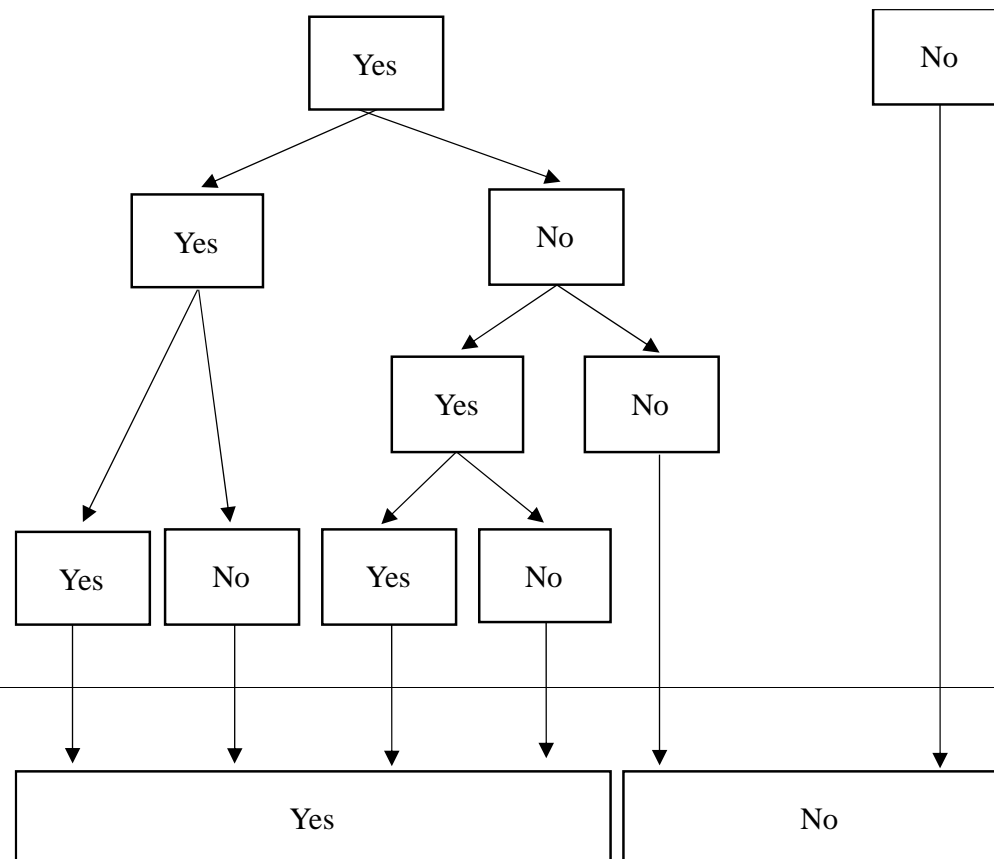
[Decisions for responses in a study with multiple effect sizes are based on majority decisions with $\geq 70\%$ for “yes”]

4.1.1. Was the assumption of independence met, or could dependence (including dependence arising from clustering) be accounted for in estimates of effect sizes and their standard errors or prevented by random assignment?

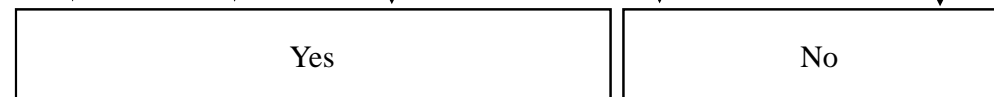
4.1.2. Were the sample sizes adequate to provide sufficiently precise estimates of effect sizes (i.e., sample size ≥ 30 in control/experimental condition)? (If yes, skip the next question)

4.1.3. Did the statistical properties of the data (e.g., distributional and variance assumptions, if any, presence of outliers) allow for valid estimates of the effect sizes?

4.1.4. Were the outcome measures sufficiently reliable to allow adequately precise estimates of the effect sizes (i.e., reporting of mean and standard deviation)?



Evaluation of the response pattern:



4.2. Precision of outcome estimation: Statistical reporting

Were the statistical tests adequately reported?

4.2.1. To what extent were sample sizes reported (or estimable) from statistical information presented?

[Decision based on majority with $\geq 70\%$ for “yes”]

4.2.2. To what extent could directions of effects be identified for important measured outcomes?

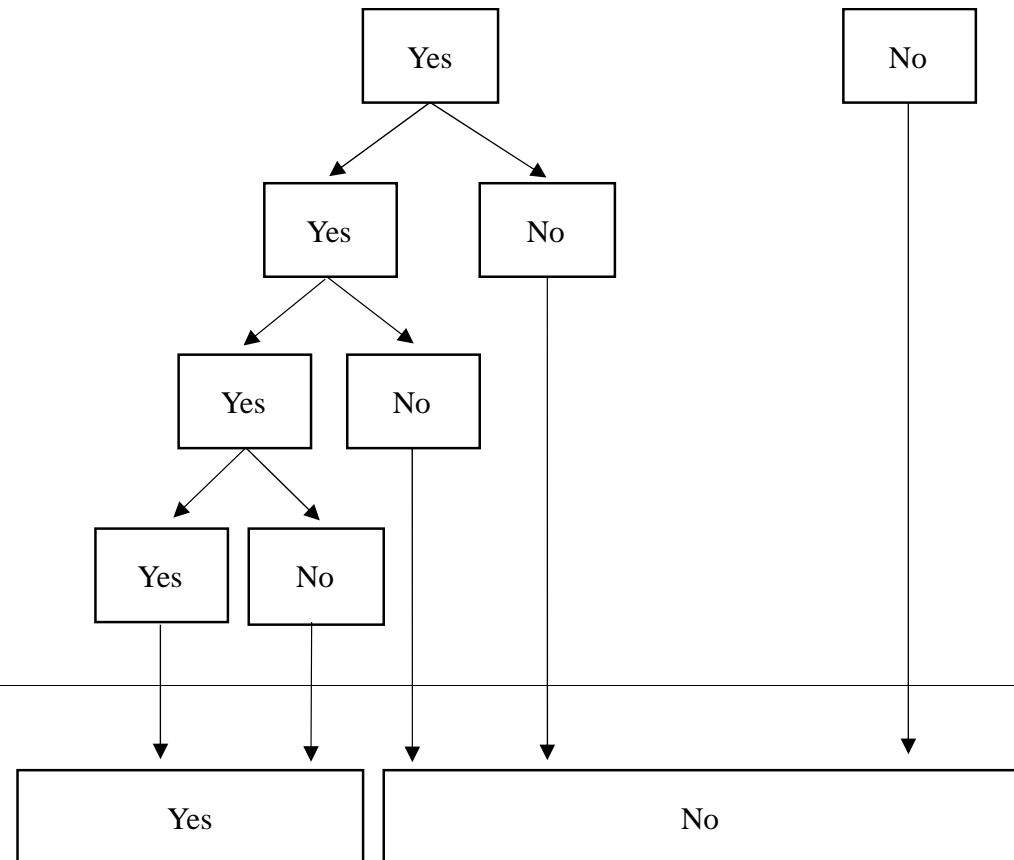
[Decision based on majority with $\geq 50\%$ for “yes”]

4.2.3. To what extent could effect sizes be estimated for important measured outcomes (focus on the ratio of extracted effect sizes to the number of mental health outcomes measured)?

[Decision based on majority with $\geq 50\%$ for “yes”]

4.2.4. Could estimates of effect sizes be computed using a standard formula (or its algebraic equivalent)?

[Decision based on majority with $\geq 50\%$ for “yes”]



Evaluation of the response pattern:

Note. Adapted version of the Study Design and Implementation Assessment Device (Study DIAD) by Valentine and Cooper (2008). The methodological quality was calculated by adding up the overall number of “yes”-evaluations of the quality factors. Quality scores ranged from 0 (all “no”) to 6 (all “yes”). The term “intervention” refers to manipulation of social discrimination. NA = Not available.

Table S1.5*Overview of Included Studies: Publication Type, Region, Group Status, Discrimination Manipulation, Mental Health Outcome, and Number of Effect Sizes*

Study	Publication	Region	Group status	Discrimination					Mental health outcome
				Discrimination type	Setting	Manipulation type	Research paradigm	Manipulation check	
Adams et al. (2006)	Journal	North America	Marginalized (3) Non-marginalized (1)	Sexism (4)	Education (4)	Single-event vs. personal (4)	Experiencing an event (4)	Significant (4)	Self-esteem (4)
Alinor (2021)	Dissertation	North America	Marginalized (1)	Racism (1)	Employment (1)	Single-event vs. neutral (1)	Experiencing an event (1)	Not reported (1)	Negative affect (1)
Alvarez (2019)	Dissertation	North America	Marginalized (2)	Racism (2)	Education (2)	Single-event vs. personal (2)	Experiencing an event (2)	Not reported (2)	Anxiety (2)
Armenta et al. (2017)	Journal	North America	Marginalized (3)	Ageism (3)	Employment (3)	Single-event vs. personal (3)	Imagination (3)	Significant (3)	Self-esteem (3)
Arriola et al. (2021)	Journal	North America	Marginalized (1)	Racism (1)	In general (1)	Single-event vs. other stressor (1)	Autobiographical recall (1)	Not reported (1)	Psychological distress (1)
Aubie & Jarry (2009)	Journal	Europe	Marginalized (2)	Body-related (2)	In general (2)	Single-event vs. neutral (2)	Reading text (2)	Not reported (2)	Negative affect (2)
Barreto et al. (2004)	Journal	Europe	Marginalized (1) Non-marginalized (2)	Sexism (2) Status-related (1)	Education (3)	Pervasive vs. outgroup (3)	Reading text (3)	Not reported (3)	Negative affect (3)
Baysu & Phalet (2019)	Journal	Europe	Marginalized (2)	Racism (2)	Education (2)	Single-event vs. neutral (2)	Task performance after induction of stereotype threat (2)	Not reported (2)	Self-esteem (1) Anxiety (1)
Blume (2020)	Dissertation	North America	Marginalized (2)	Racism (2)	In general (2)	Single-event vs. other stressor (2)	Autobiographical recall (2)	Not reported (2)	Positive affect (1) Negative affect (1)
Bradley-Geist et al. (2015)	Journal	North America	Marginalized (2)	Sexism (2)	Employment (2)	Single-event vs. neutral (2)	Reading text (2)	Not reported (2)	Self-esteem (2)
Brenchley (2012)	Dissertation	North America	Mixed group status (4)	Body-related (4)	In general (4)	Single-event vs. neutral (4)	Experiencing an event (4)	Not reported (4)	Depressed affect (1) Anxiety (2) Other-directed emotions (1)
Brown et al. (2010)	Journal	North America	Mixed group status (4)	Sexism (4)	In general (4)	Single-event vs. personal (4)	Experiencing an event (4)	Significant (4)	Self-esteem (4)
Chavez et al. (2019)	Journal	North America	Marginalized (4)	Racism (4)	Political advertisement (4)	Pervasive vs. neutral (4)	Reading text and viewing images (4)	Significant (4)	Well-being (1) Psychological distress (1) Positive affect (1) Negative affect (1)
Cheng (2020)	Journal	Asia	Marginalized (1)	Ageism (1)	In general (1)	Single-event vs. other stressor (1)	Make stereotypes toward one's group salient (1)	Significant (1)	Anxiety (1)
Cotting (2003)	Dissertation	North America	Marginalized (14)	Sexism (7) Racism (7)	Education (14)	Single-event vs. neutral (14)	Task performance after induction of stereotype threat (14)	Not reported (14)	Anxiety (4) Positive affect (2) Negative affect (4)

Study	Publication	Region	Group status	Discrimination					Mental health outcome
				Discrimination type	Setting	Manipulation type	Research paradigm	Manipulation check	
Coudin & Alexopoulos (2010)	Journal	Europe	Marginalized (2)	Ageism (2)	In general (2)	Pervasive vs. neutral (2)	Make stereotypes toward one's group salient (2)	Not reported (2)	Other-directed emotions (2) Self-directed emotions (2) Self-esteem (1) Negative affect (1)
Crandall et al. (2000)	Journal	North America	Marginalized (1)	Sexism (1)	Education (1)	Single-event vs. neutral (1)	Reading text (1)	Significant (1)	Self-esteem (1)
Cunningham et al. (2012)	Journal	North America	Marginalized (2)	Sexism (2)	Employment (2)	Single-event vs. other stressor (2)	Experiencing an event (1) Reading text (1)	Not reported (2)	Psychological distress (2)
Désert et al. (2013)	Journal	Europe	Marginalized (1)	Sexism (1)	In general (1)	Single-event vs. other stressor (1)	Task performance after induction of stereotype threat (1)	Not reported (1)	Anxiety (1)
Dion (1975)	Journal	North America	Marginalized (1)	Sexism (1)	Interpersonal relationships (1)	Single-event vs. personal (1)	Experiencing an event (1)	Significant (1)	Self-esteem (1)
Dion & Earn (1975)	Journal	North America	Marginalized (2)	Antisemitism (2)	Interpersonal relationships (2)	Single-event vs. personal (2)	Experiencing an event (2)	Significant (2)	Self-esteem (1) Psychological distress (1)
Eniç & Tosun (2021)	Journal	Asia	Marginalized (8)	Sexism (8)	Employment (8)	Single-event vs. neutral (8)	Imagination (8)	Significant (8)	Anxiety (1) Positive affect (3) Negative affect (1) Other-directed emotions (1) Self-directed emotions (2) Self-esteem (4) Psychological distress (2) Positive affect (2) Other-directed emotions (2) Well-being (2)
Fisher (2020)	Dissertation	North America	Marginalized (10)	Sexism (10)	In general (10)	Single-event vs. personal (5) Other (5)	Experiencing an event (10)	Significant (10)	Depressed affect (1) Anxiety (1) Other-directed emotions (1) Other-directed emotions (2)
Foster & Tsarfati (2005)	Journal	North America	Marginalized (2)	Sexism (2)	Education (2)	Single-event vs. personal (2)	Experiencing an event (2)	Significant (2)	Well-being (2)
Gibbons et al. (2010)	Journal	North America	Marginalized (3)	Racism (3)	Employment (3)	Other (3)	Imagination (3)	Not reported (3)	Depressed affect (1) Anxiety (1) Other-directed emotions (1) Other-directed emotions (2)
Gibbons et al. (2012)	Journal	North America	Marginalized (2)	Racism (2)	Employment (2)	Single-event vs. neutral (1) Single-event vs. other stressor (1)	Imagination (2)	Not reported (2)	Other-directed emotions (2)
Goepfert et al. (2019)	Journal	Europe	Marginalized (3)	Sanism (3)	(Social) Media (3)	Single-event vs. neutral (3)	Viewing video clip (3)	Significant (3)	Self-esteem (1) Positive affect (1) Negative affect (1)

Study	Publication	Region	Group status	Discrimination					Mental health outcome
				Discrimination type	Setting	Manipulation type	Research paradigm	Manipulation check	
Hansen & Sassenberg (2011)	Journal	Europe	Non-marginalized (2)	Status-related (2)	Education (2)	Single-event vs. external (2)	Imagination (2)	Significant (2)	Other-directed emotions (1) Self-directed emotions (1)
Hansen et al. (2006)	Journal	Europe	Marginalized (8) Non-marginalized (6)	Sexism (8) Status-related (6)	Education (4) Employment (6) In general (4) Health care (1)	Single-event vs. personal (7) Single-event vs. external (7)	Imagination (10) Autobiographical recall (4)	Significant (14)	Other-directed emotions (7) Self-directed emotions (7)
He et al. (2020)	Journal	Asia	Non-marginalized (1)	Meta-stereotypes in doctors-patients relationship (1) Sexism (4)	Employment (4)	Single-event vs. neutral (4)	Make stereotypes toward one's group salient (1)	Not reported (1)	Anxiety (1)
Hoyt & Blascovich (2010)	Journal	North America	Marginalized (4)	Racism (2)	Employment (2)	Single-event vs. personal (2)	Make stereotypes toward one's group salient (4) Experiencing an event (2)	Significant (4)	Self-esteem (2) Depressed affect (2)
Hoyt et al. (2007)	Journal	North America	Marginalized (1) Mixed group status (1)	Racism (2)	Employment (2)	Single-event vs. personal (2)	Experiencing an event (2)	Significant (2)	Well-being (2)
Huynh et al. (2017)	Journal	North America	Marginalized (2)	Racism (2)	Education (1) Interpersonal relationships (1) In general (1)	Single-event vs. neutral (2)	Hearing audio clip (2)	Not reported (2)	Negative affect (2)
Kaiser et al. (2004)	Journal	North America	Marginalized (1)	Sexism (1)	In general (1)	pervasive vs. outgroup (1)	Reading text (1)	Significant (1)	Well-being (1)
Kankesan (2012)	Dissertation	North America	Marginalized (2)	Racism (2)	Employment (2)	Single-event vs. personal (2)	Imagination (2)	Significant (2)	Positive affect (1) Negative affect (1)
Keller & Dauenheimer (2003)	Journal	Europe	Marginalized (5)	Sexism (5)	Education (5)	Single-event vs. neutral (5)	Task performance after induction of stereotype threat (5)	Not reported (5)	Anxiety (1) Positive affect (2) Negative affect (2)
Lee et al. (2011)	Journal	NA	Marginalized (2)	Sexism (2)	In general (2)	Single-event vs. neutral (2)	Task performance after induction of stereotype threat (2)	Not reported (2)	Anxiety (2)
Lee-Won et al. (2017)	Journal	North America	Marginalized (2)	Racism (2)	(Social) Media (2)	Single-event vs. neutral (2)	Reading text (2)	Significant (2)	Other-directed emotions (1) Self-directed emotions (1)
Lemonaki et al. (2015)	Journal	Europe	Marginalized (2)	Sexism (2)	In general (2)	Pervasive vs. neutral (2)	Reading text (2)	Significant (2)	Other-directed emotions (1) Self-directed emotions (1)
Levy et al. (2022)	Journal	North America	Marginalized (4) Non-marginalized (4)	Ageism (8)	Health care (8)	Single-event vs. neutral (8)	Make stereotypes toward one's group salient (8)	Not reported (8)	Anxiety (4) Positive affect (4)
Lin (2012)	Dissertation	North America	Marginalized (4)	Racism (4)	In general (4)	Single-event vs. neutral (2)	Imagination (4)	Significant (4)	Positive affect (2) Negative affect (2)

Study	Publication	Region	Group status	Discrimination					Mental health outcome
				Discrimination type	Setting	Manipulation type	Research paradigm	Manipulation check	
Ma et al. (2022)	Journal	Asia	Marginalized (1)	Sexism (1)	In general (1)	Pervasive vs. neutral (2) Single-event vs. neutral (1)	Make stereotypes toward one's group salient (1)	Not reported (1)	Anxiety (1)
Magallares et al. (2011)	Journal	Europe	Marginalized (3)	Body-related (3)	Employment (3)	Pervasive vs. neutral (3)	Reading text (3)	Significant (3)	Self-esteem (1) Well-being (1) Other-directed emotions (1)
Major et al. (1998)	Journal	North America	Marginalized (4)	Racism (4)	In general (4)	Single-event vs. personal (4)	Experiencing an event (4)	Significant (4)	Self-esteem (4)
Major et al. (2003)	Journal	North America	Non-marginalized (1)	Sexism (1)	Education (1)	Single-event vs. personal (1)	Experiencing an event (1)	Significant (1)	Self-esteem (1)
Major et al. (2003)	Journal	North America	Mixed group status (8)	Sexism (8)	Education (8)	Single-event vs. personal (4) Single-event vs. external (4)	Imagination (8)	Significant (8)	Depressed affect (2) Anxiety (2) Other-directed emotions (2) Self-directed emotions (2)
McCoy & Major (2003)	Journal	North America	Marginalized (5)	Sexism (2) Racism (3)	In general (5)	Single-event vs. personal (2) Pervasive vs. outgroup (3)	Experiencing an event (2) Reading text (3)	Significant (5)	Self-esteem (1) Depressed affect (2) Other-directed emotions (2)
Meegan & Kashima (2010)	Journal	Australia	Non-marginalized (2)	Racism (4)	Education (4)	Pervasive vs. single (4)	Reading text (4)	Significant (4)	Self-esteem (2) Depressed affect (2)
Mendes et al. (2008)	Journal	North America	Marginalized (3) Non-marginalized (3)	Racism (6)	Education (6)	Single-event vs. personal (6)	Experiencing an event (6)	Significant (6)	Positive affect (2) Other-directed emotions (2) Self-directed emotions (2)
Mills (2016)	Dissertation	North America	Non-marginalized (1)	Linguicism (local accent) (1)	In general (1)	Single-event vs. neutral (1)	Autobiographical recall (1)	Not reported (1)	Self-esteem (1)
Owuamalam & Zagefka (2014)	Journal	Europe	Marginalized (1)	Racism (1)	In general (1)	Pervasive vs. neutral (1)	Make stereotypes toward one's group salient (1)	Not reported (1)	Self-esteem (1)
Pacilli et al. (2019)	Journal	Europe	Marginalized (1)	Sexism (1)	Employment (1)	Single-event vs. neutral (1)	Reading text (1)	Significant (1)	Anxiety (1)
Paterson et al. (2019)	Journal	Europe NA	Marginalized (8)	Heterosexism (8)	In general (8)	Single-event vs. other stressor (8)	Reading text (8)	Significant (8)	Anxiety (2) Other-directed emotions (2) Self-directed emotions (4)
Pinel (2004)	Journal	North America	Marginalized (2)	Sexism (2)	Education (2)	Single-event vs. personal (2)	Experiencing an event (2)	Significant (2)	Self-esteem (2)
Platow et al. (2005)	Journal	Australia	Mixed group status (2)	Status-related (2)	Employment (2)	Single-event vs. neutral (2)	Reading text (2)	Significant (2)	Self-esteem (2)
Rodriguez et al. (2016)	Journal	North America	Non-marginalized (5)	Body-related (5)	In general (5)	Single-event vs. neutral (5)	Experiencing an event (5)	Significant (5)	Self-esteem (1) Depressed affect (1)

Study	Publication	Region	Group status	Discrimination					Mental health outcome
				Discrimination type	Setting	Manipulation type	Research paradigm	Manipulation check	
Schmader et al. (2015)	Journal	North America	Marginalized (6)	Racism (6)	(Social) Media (6)	Single-event vs. neutral (6)	Make stereotypes toward one's group salient (6)	Significant (6)	Anxiety (1) Negative affect (1) Other-directed emotions (1) Self-esteem (2) Positive affect (1) Other-directed emotions (1) Self-directed emotions (2) Other-directed emotions (2) Self-directed emotions (3)
Schmitt (2003)	Dissertation	North America	Non-marginalized (5)	Sexism (5)	Education (5)	Single-event vs. personal (3) Single-event vs. external (2)	Imagination (5)	Significant (5)	Other-directed emotions (2) Self-directed emotions (3)
Schmitt et al. (2003)	Journal	North America	Marginalized (6)	Sexism (6)	Education (2) Employment (4)	Single-event vs. external (2) Pervasive vs. single (2) Other (2)	Reading text (2) Experiencing an event (4)	Significant (6)	Self-esteem (4) Positive affect (2)
Schmuck et al. (2017)	Journal	Europe	Marginalized (1)	Islamophobia (1)	Political advertisement (1)	Single-event vs. neutral (1)	Reading text and viewing images (1)	Significant (1)	Self-esteem (1)
Shenton-Bewsh et al. (2016)	Journal	North America	Non-marginalized (2)	Body-related (2)	In general (2)	Single-event vs. neutral (1) Single-event vs. other stressor (1)	Reading text (2)	Not reported (2)	Self-esteem (2)
Spaccatini & Roccato (2021)	Journal	Europe	Marginalized (4)	Sexism (4)	Employment (4)	Single-event vs. neutral (4)	Reading text (4)	Significant (4)	Depressed affect (2) Anxiety (2)
Stepanova et al. (2019)	Journal	North America	Mixed group status (4)	Mixed (4)	In general (4)	Single-event vs. neutral (2) Single-event vs. other stressor (2)	Autobiographical recall (4)	Not reported (4)	Psychological distress (2) Negative affect (2)
Stroebe et al. (2010)	Journal	Europe	Marginalized (2)	Racism (2)	Education (2)	Single-event vs. personal (2)	Experiencing an event (2)	Not reported (2)	Negative affect (2)
Sunny et al. (2017)	Journal	North America	Marginalized (1) Non-marginalized (1)	Sexism (2)	Education (2)	Single-event vs. neutral (2)	Task performance after induction of stereotype threat (2)	Not reported (2)	Anxiety (2)
Swift et al. (2013)	Journal	Europe	Marginalized (1)	Ageism (1)	In general (1)	Single-event vs. neutral (1)	Task performance after induction of stereotype threat (1)	Significant (1)	Anxiety (1)
Triana et al. (2019)	Journal	North America	Mixed group status (1)	Sexism (1)	Employment (1)	Single-event vs. external (1)	Reading text (1)	Not reported (1)	Anxiety (1)
Tropp (2003)	Journal	North America	Marginalized (2) Non-marginalized (2)	Racism (2) Random group status (2)	Education (2) In general (2)	Single-event vs. neutral (4)	Experiencing an event (4)	Not reported (4)	Anxiety (2) Other-directed emotions (2)

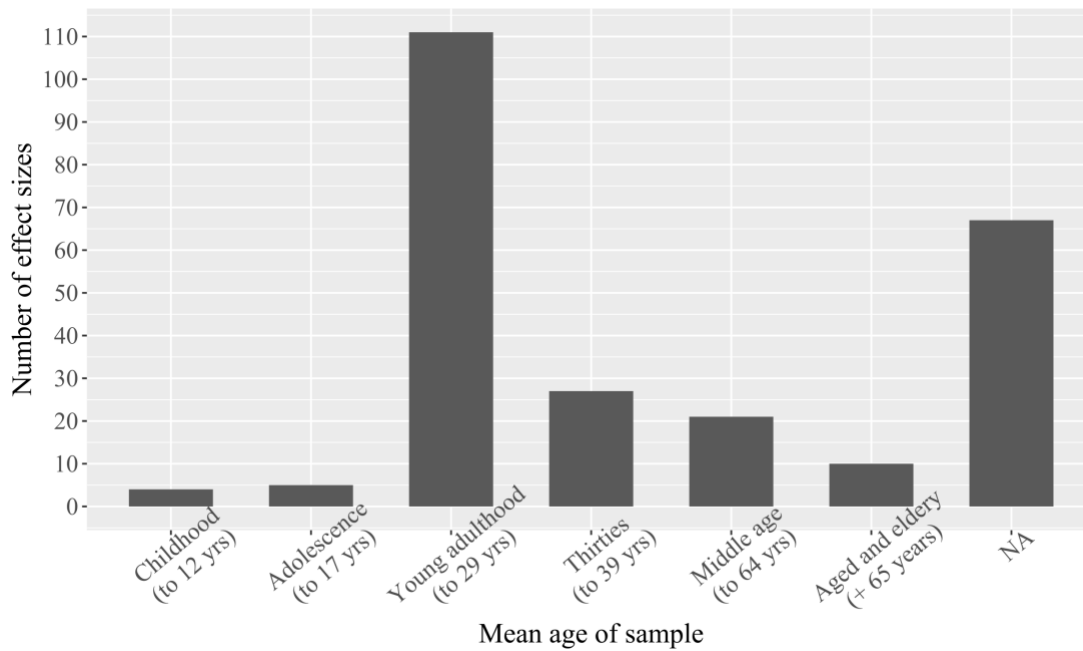
Study	Publication	Region	Group status	Discrimination				Mental health outcome	
				Discrimination type	Setting	Manipulation type	Research paradigm		Manipulation check
Van Breen & Barreto (2022)	Journal	Europe	Marginalized (2)	Sexism (2)	Employment (2)	Pervasive vs. neutral (2)	Reading text (2)	Significant (2)	Other-directed emotions (2)
Van Dyk et al. (2021)	Journal	North America	Marginalized (9)	Heterosexism (9)	In general (9)	Single-event vs. neutral (9)	Viewing video clip (9)	Not reported (9)	Psychological distress (1) Negative affect (5) Other-directed emotions (2) Self-directed emotions (1)
Weiss et al. (2013)	Journal	Europe	Marginalized (2)	Ageism (2)	In general (2)	Single-event vs. neutral (2)	Make stereotypes toward one's group salient (2)	Not reported (2)	Self-esteem (2)
West (2019)	Journal	Europe	Marginalized (2)	Racism (2)	In general (2)	Single-event vs. neutral (2)	Autobiographical recall (2)	Significant (2)	Positive affect (1) Negative affect (1)
Wong-Padoongpatt et al. (2017)	Journal	North America	Marginalized (3)	Racism (3)	Education (3)	Single-event vs. neutral (3)	Experiencing an event (3)	Not reported (3)	Self-esteem (2) Psychological distress (1)

Note. Group status was classified as marginalized when the sample possessed a social identity that was historically marginalized and subject to the induced discrimination type in the study. For example, when discrimination type was sexism, samples including participants identifying as men were categorized as non-marginalized, samples including participants identifying as women as marginalized, and samples including men and women as “mixed”; when samples included participants identifying as men and a marginalized identity (e.g., being part of an ethnic minority), the classification of the sample was non-marginalized. All samples from studies on discrimination targeting non-marginalized identities, such as specific university study majors, were classified as non-marginalized. Other-directed emotions encompass externally directed negative emotions of hostility and anger. The numbers in parentheses represent the number of respective effect sizes. For detailed information on each effect size, please see the comprehensive dataset in the Open Science Framework (<https://osf.io/5fqa2/>). NA = Not available.

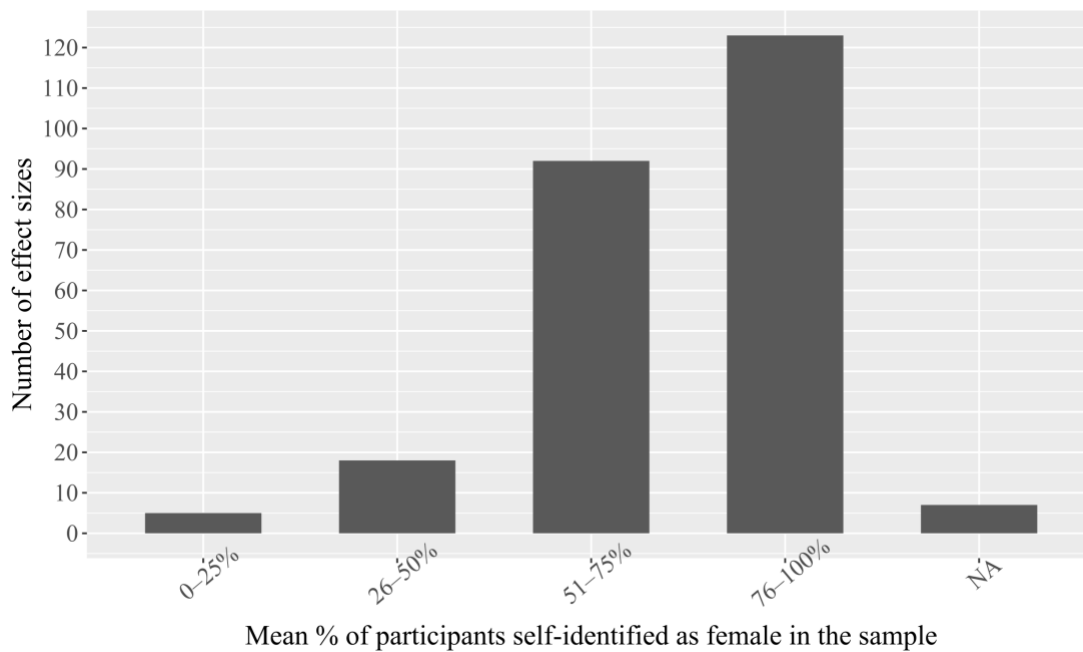
Figure S1.1

Distribution of Age and Gender Among Effect Sizes

(a)



(b)



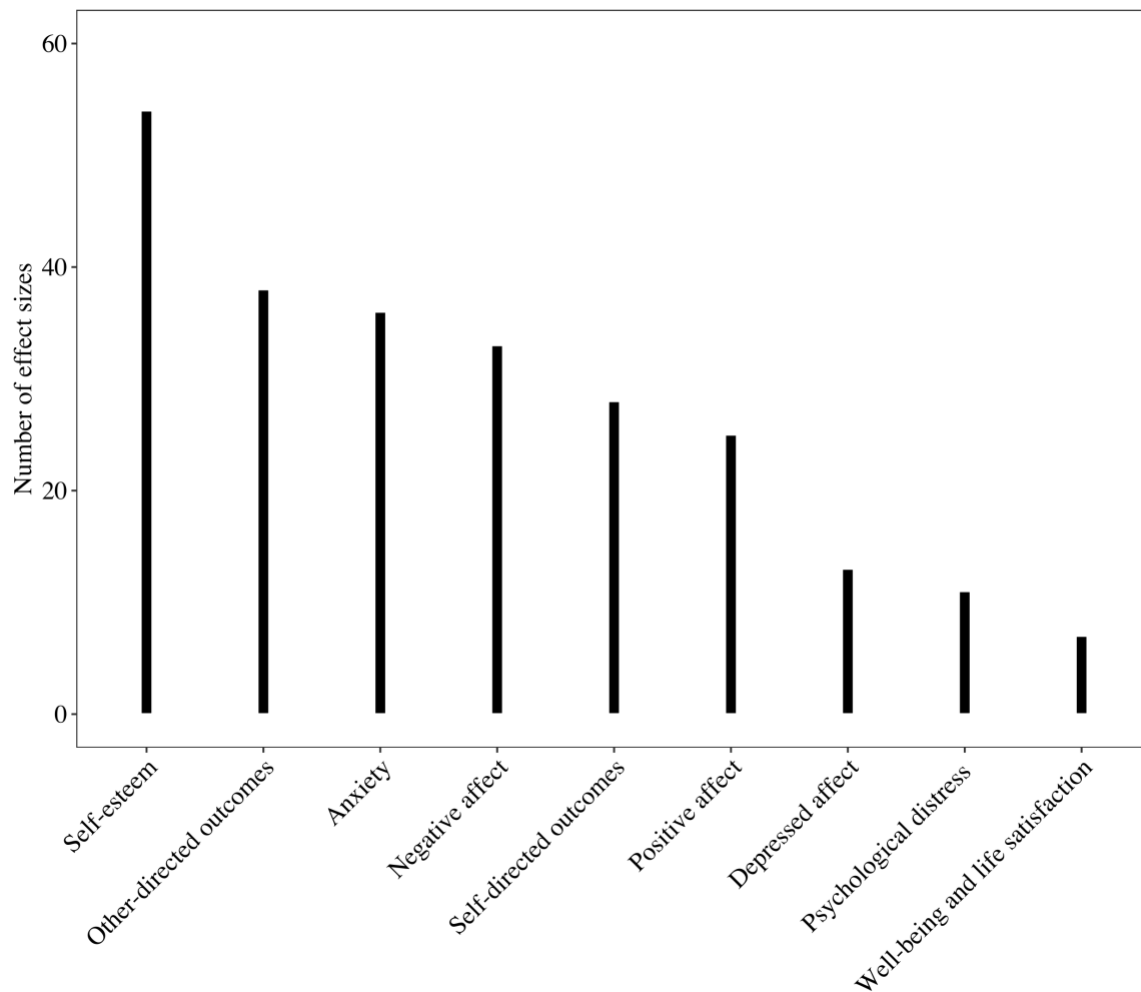
Note. Distribution of (a) age (mean age of participants in the sample) and (b) gender (proportion of participants who self-identified as female in the sample) in relation to the corresponding number of effect sizes. NA refers to missing values.

Table S1.5*Research Paradigms by Manipulation Type*

Research paradigm	Manipulation type								
	Single event				Pervasive discrimination				
	vs. personal attribution (<i>k</i> = 57)	vs. external attribution (<i>k</i> = 19)	vs. neutral control (<i>k</i> = 111)	vs. non-discriminatory stress (<i>k</i> = 19)	Other ^a (<i>k</i> = 8)	vs. single event (<i>k</i> = 6)	vs. pervasive outgroup (<i>k</i> = 7)	vs. neutral control (<i>k</i> = 16)	vs. external attribution (<i>k</i> = 2)
Direct experience									
Experiencing an event	39	2	17	1	5	0	0	0	2
Stereotype threat and task	0	0	26	2	0	0	0	0	0
Salience induction									
Autobiographical recall	2	2	5	4	0	0	0	0	0
Salience of stereotypes	0	0	22	1	0	0	0	3	0
Vicarious experience									
Imagination	16	14	11	1	3	0	0	2	0
Reading text	0	1	15	10	0	6	7	7	0
Viewing images/pictures	0	0	12	0	0	0	0	0	0
Watching video clip	0	0	2	0	0	0	0	0	0
Hearing audio clip	0	0	0	0	0	0	0	0	0
Mixed: reading and images	0	0	1	0	0	0	0	4	0

Note. *k* represents the number of effect sizes.

^a Includes single-event manipulations compared to a mean of neutral and nondiscriminatory stressor conditions (*k* = 3 from one experiment where data was not sufficient to include pair-wise comparisons) and compared to a control condition with a lower level of discrimination than that in the experimental groups (*k* = 5 from one experiment).

Figure S1.2*Distribution of the Specific Mental Health Outcomes Among Effect Sizes*

Note. The other-directed outcomes category consists of externalizing negative emotions including (other-directed) anger ($k = 26$), hostility ($k = 10$), and measures of anger and hostility ($k = 2$). The self-directed outcomes category consists of self-directed negative emotions including self-directed anger ($k = 8$), self-directed affect ($k = 7$), shame ($k = 4$), guilt ($k = 3$), disappointment ($k = 2$), self-blame ($k = 2$), humiliation ($k = 1$), being despised ($k = 1$). Mental health outcomes were mainly assessed as acute (89%); both acute and more chronic measures are combined in this figure.

Figure S1.3

Funnel Plots for the Exploratory Subgroup Analyses

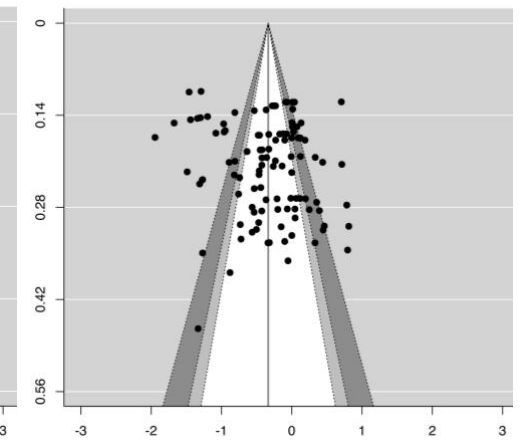
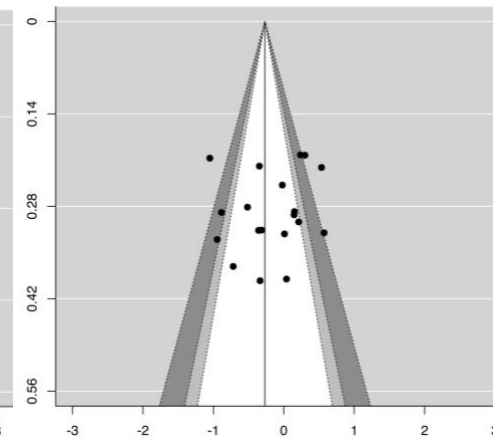
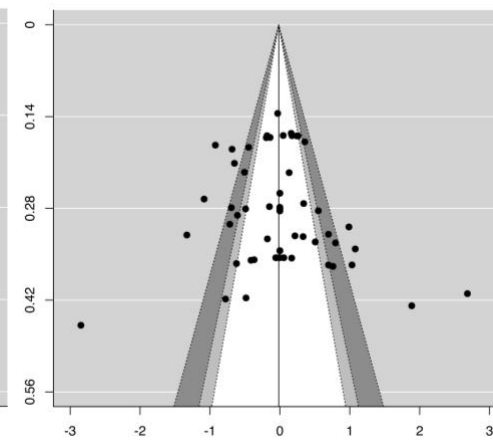
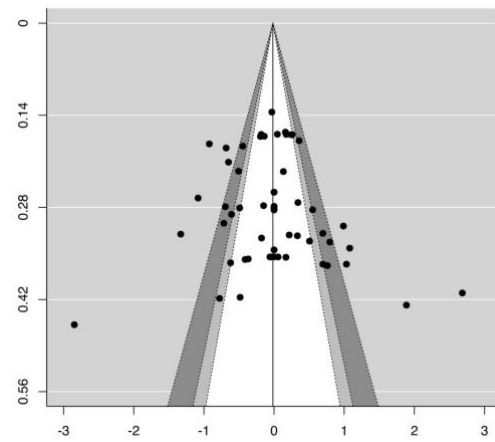
(1) Funnel plots for separate meta-analyses for the different manipulation types

(a) Single-event vs. personal attribution

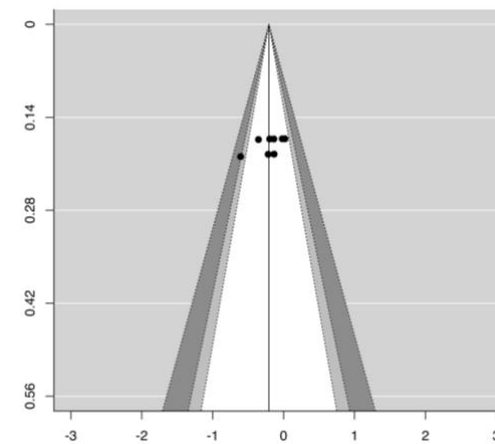
(b) Single-event vs. external attribution

(c) Single-event vs. neutral control condition

(d) Single-event vs. nondiscriminatory stressor

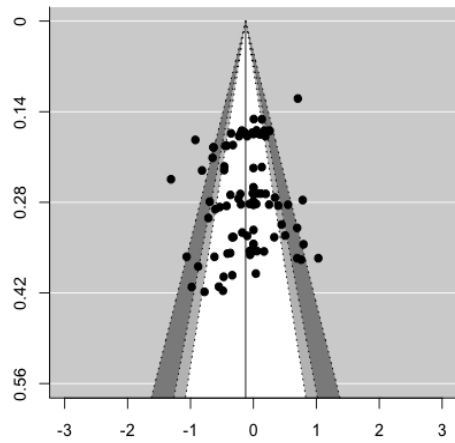


(e) Pervasive vs. neutral control condition

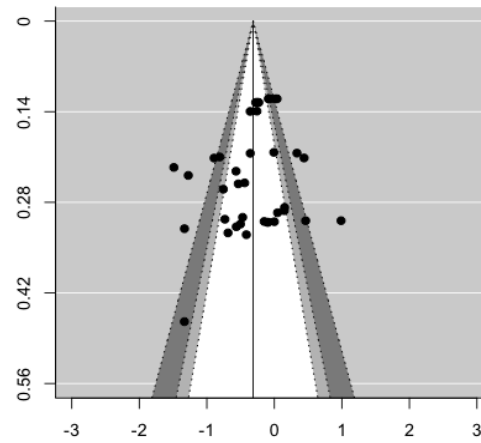


(2) Funnel plots for separate meta-analyses for the different research paradigms

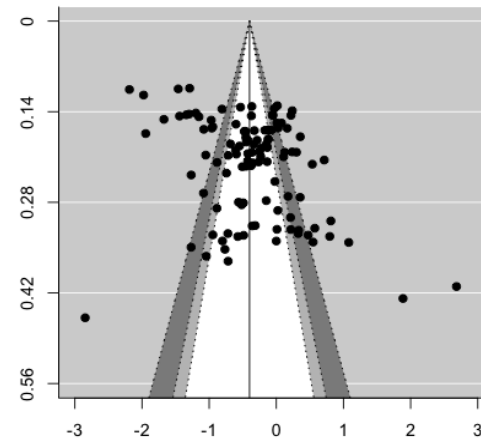
(a) Direct experience paradigms



(b) Salience induction paradigms

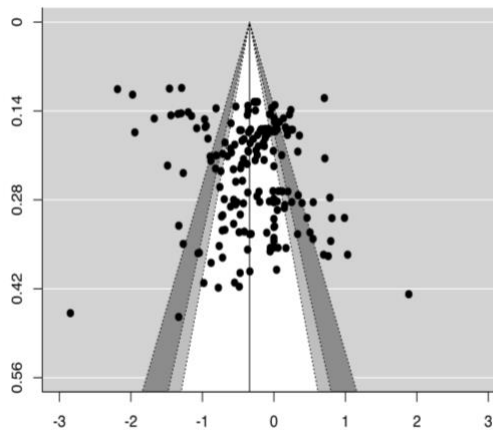


(c) Vicarious experience paradigms

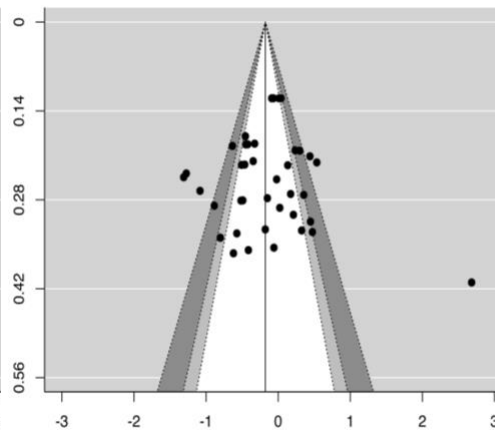


(3) Funnel plots for separate meta-analyses for studies investigating samples with different group status

(a) Marginalized

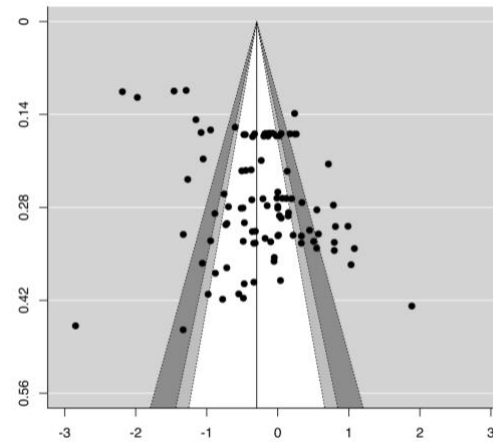


(b) Non-marginalized group status

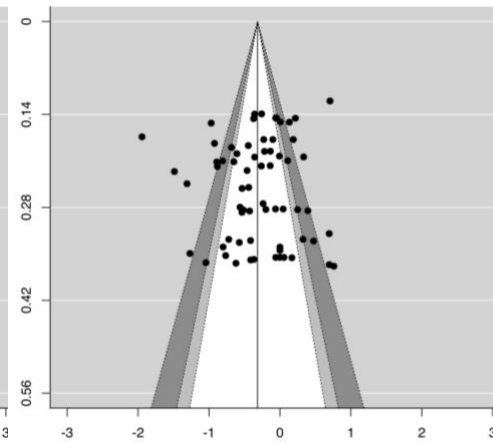


(4) Funnel plots for separate meta-analyses for the different discrimination types

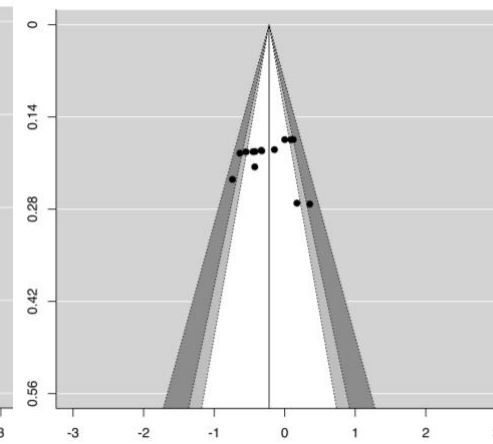
(a) Sexism



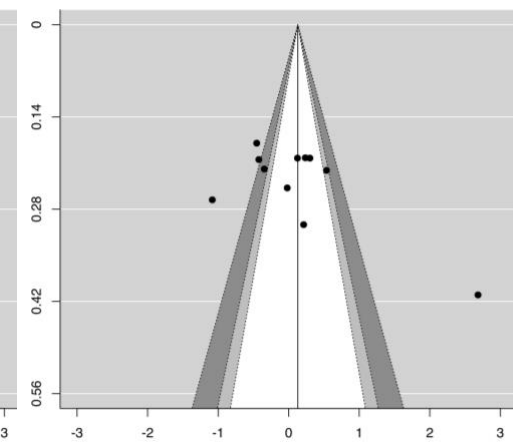
(b) Racism



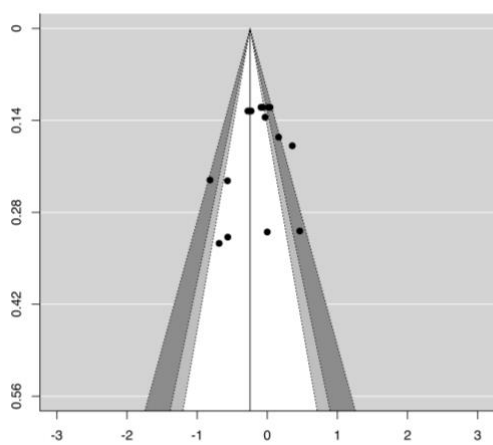
(c) Body-related discrimination



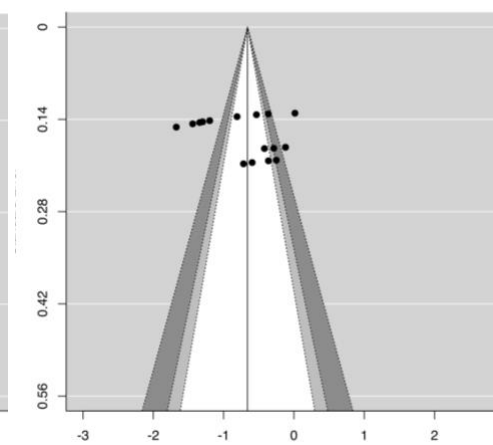
(d) Status-related discrimination



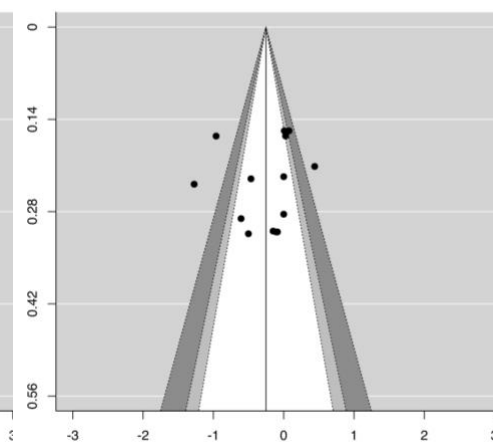
(e) Ageism



(f) Heterosexism

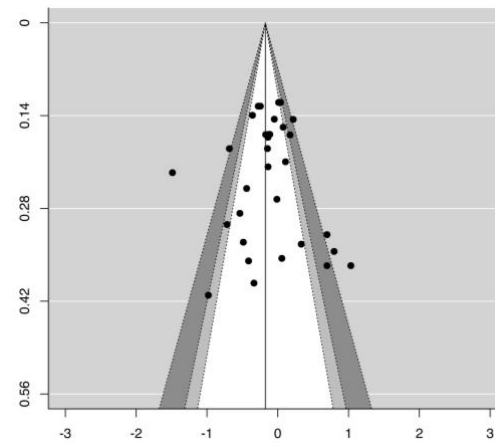


(g) Other forms of discrimination

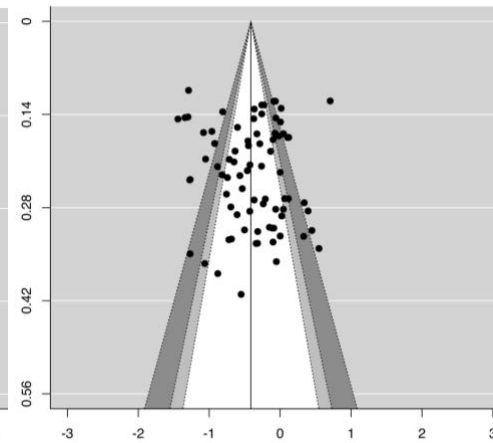


(5) Funnel plots for separate meta-analyses for the different mental health outcome types

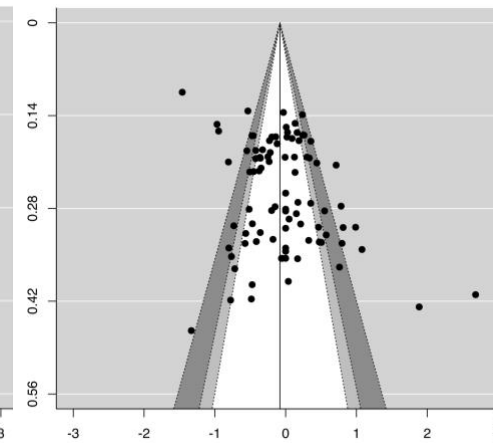
(a) Well-being-related mental health outcomes (b) Distress-related mental health outcomes



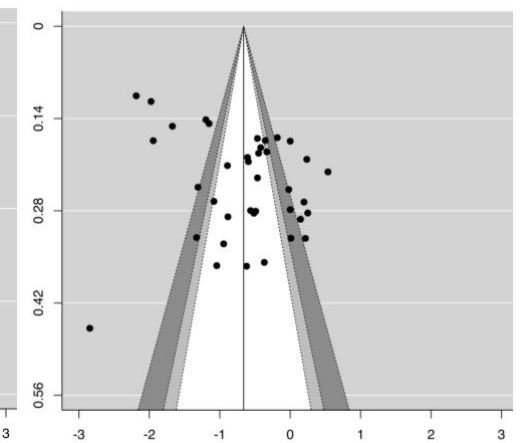
(c) Self-directed mental health outcomes (d) Other-directed mental health outcomes



(c) Self-directed mental health outcomes



(d) Other-directed mental health outcomes



Note. Funnel plots for the effects of subsets for (1) different types of manipulation, (2) different research paradigms, (3) different group statuses, (4) discrimination types, and (5) different mental health outcome types. Please note that separate meta-analyses could be estimated only for subsets with more than 10 effect sizes. The y-axis represents the standard error, the x-axis the effect sizes Hodges's g . The diagonal lines represent 95% confidence intervals of the probability that effect sizes differ from the mean effect size: White region $p > .10$, light-gray region $p = .10$ to $.05$, dark-gray region $p = .05$ to $.01$, region outside of the funnel plot $p < .01$.

Table S1.6

Exploratory Subgroup Analyses: Separate Three-Level Meta-Analyses for Research Paradigms and Types of Mental Health Outcomes in Subsets of Manipulation Types

Variable	<i>k</i>	<i>g</i>	95% CI	σ^2_1	σ^2_2	Residual heterogeneity
Research paradigms in different manipulation types						
Subset of single-event discrimination compared to personal and external attributions						
Direct experience ^a	41	-0.06	[-0.24, 0.11]	0.04	0.06	$Q(40) = 97.37^{***}$
Saliency induction ^b	4	-0.01	[-1.53, 1.51]	0.82	0.00	$Q(3) = 28.00^{***}$
Vicarious experience ^c	31	-0.07	[-0.40, 0.26]	0.71	0.00	$Q(30) = 229.42^{***}$
Subset of single-event discrimination compared to neutral control and nondiscriminatory stressors						
Direct experience ^a	46	-0.17	[-0.39, 0.06]	0.04	0.12	$Q(45) = 164.97^{***}$
Saliency induction ^b	32	-0.36 ^{***}	[-0.54, -0.17]	0.12	0.02	$Q(31) = 125.19^{***}$
Vicarious experience ^c	52	-0.42 ^{**}	[-0.71, -0.13]	0.13	0.26	$Q(51) = 604.92^{***}$
Subset of pervasive discrimination						
Direct experience ^a	2	-0.72	[-4.34, 2.90]	0.00	0.00	$Q(1) = 0.79$
Saliency induction ^b	3	-0.36	[-1.24, 0.52]	0.02	0.00	$Q(2) = 2.37$
Vicarious experience ^c	26	-0.52 ^{**}	[-0.91, -0.14]	0.17	0.25	$Q(25) = 530.00^{***}$
Mental health outcomes in different manipulation types						
Subset of single-event discrimination						
Well-being-related ^d	26	-0.17	[-0.42, 0.08]	0.03	0.16	$Q(25) = 97.17^{***}$
Distress-related ^e	73	-0.41 ^{***}	[-0.55, -0.27]	0.10	0.09	$Q(72) = 531.15^{***}$
Self-directed ^f	82	-0.05	[-0.20, 0.09]	0.13	0.09	$Q(81) = 501.74^{***}$
Other-directed ^g	33	-0.55 ^{***}	[-0.79, -0.31]	0.39	0.00	$Q(32) = 283.69^{***}$
Subset of pervasive discrimination						
Well-being-related ^d	6	-0.14	[-0.52, 0.24]	0.01	0.05	$Q(5) = 10.98^\dagger$
Distress-related ^e	7	-0.47 [*]	[-0.81, -0.12]	0.03	0.03	$Q(6) = 14.91^*$
Self-directed ^f	13	-0.24 [†]	[-0.50, .01]	0.09	0.00	$Q(12) = 30.38^{**}$
Other-directed ^g	5	-1.17 [*]	[-2.22, -0.12]	0.01	0.52	$Q(4) = 95.39^{***}$

Note. For exploratory subgroup analyses, separate meta-analyses under random effects assumption were conducted for the different types of manipulation, the effect of different types of discrimination on mental health, and for the effect of discrimination on different types of mental health outcomes. Separate meta-analyses with fewer than 10 effect sizes are displayed for completeness and should only be interpreted with caution.

k = number of effect sizes; *g* = Hedges's *g*; CI = confidence interval; σ^2_1 = variance within studies (Level 2); σ^2_2 = variance between studies (Level 3).

^a Direct experience of discrimination, stereotype threat followed by performing a task.

^b Autobiographical recall, making general stereotypes about one's group salient.

^c Imagination, study material (text, images, video, audio) that includes discrimination-related information.

^d Well-being, life satisfaction, positive affect.

^e Psychological distress, negative affect, anxiety.

^f Self-esteem, depressed affect, other internally directed emotions such as shame or guilt.

^g Externally directed negative emotions such as hostility and anger.

[†] $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

Figure S1.4

GRADE Ratings Assessing the Quality of the Body of Evidence Contributing to the Effect Estimates of the Meta-Analysis

RCT level evidence: HIGH ⊕⊕⊕⊕

1. Risk of bias and limitations of study design: Likely

Action: Downgrading of one level ⊖

Reason: The spectrum of participants was not representative of subgroups experiencing different types of discrimination nor were probability sampling methods used in primary studies. With few exceptions, primary studies did not consider inappropriate exclusions and severe attrition in analysis and discussion of results.

2. Indirectness: Unlikely

Action: No downgrading

Reason: All included trials were relevant to the meta-analytic question, no indirect comparators were used, and all studies reported successful manipulation of discrimination and mental health as outcomes.

3. Inconsistency of results: Likely

Action: Downgrading of one level ⊖

Reasons: Systematic heterogeneity between effect sizes was substantial, $I^2 > 50\%$.

4. Imprecision: Unlikely

Action: No downgrading

Reason: Number of participants is large with $N < 400$, 95% confidence interval of the mean effect does not cross the line of no effect and is relatively narrow.

5. Publication bias (and selective reporting): Not suspected

Action: No downgrading

Reason: Visual funnel plot inspection showed a positive skewed distribution of effect sizes but no significant evidence of asymmetry. The methodological quality assessment suggests no selective outcome reporting.

Overall quality of evidence rating: Moderate ⊕⊕⊖⊖

Interpretation

Moderate ⊕⊕⊖⊖ The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different

Note. GRADE = Grading of recommendations, assessment, development, and evaluation approach (Schünemann et al., 2013); RCT = randomized controlled trial; ⊕ high level of evidence; ⊖ downgrading of evidence levels.

Manuscript 2 – Long-term discrimination effects on adolescent health behaviors and well-being in four countries

Manuscript submitted for publication:

Emmer, C., Neumer, A., Kalter, F., & Mata, J. (2024). *Long-term discrimination effects on adolescent health behaviors and well-being in four countries* [Manuscript submitted for publication].

Aside from minor changes to the format, the manuscript included in this dissertation reflects the manuscript that was submitted for publication.

Abstract

Objective: Adolescence is a pivotal foundation for lifelong health and a phase vulnerable to the adverse effects of discrimination. We assessed the impact of perceived discrimination on adolescent well-being over 3 years and the mediating effects of protective (physical activity, nutrition, sleep) and risky (substance use) health behaviors.

Methods: Adolescents ($N = 9,957$; $M_{\text{age}} = 14.90$ years) from the CILS4EU multinational panel (a longitudinal survey in four European countries) across three waves were examined. Direct and indirect relationships were analyzed using path models, adjusting for baseline health behaviors, well-being, and control variables (age, gender, socioeconomic status, migration, religion).

Results: Adolescents reported the most discrimination instances within the school environment. Perceived discrimination at Wave 1 was significantly associated with decreased well-being at Wave 3 ($\beta = -.04, p < .001$) and decreased protective (physical activity: $\beta = -.02$, nutrition: $\beta = -.04$, sleep: $\beta = -.04$) and increased risky (substance use: $\beta = .03$) health behaviors at Wave 2. Nutrition and sleep mediated the relationship between perceived discrimination and well-being; no mediation was found for physical activity and substance use.

Conclusions: Even in observational data with 1-year assessment intervals, detrimental long-term effects of perceived discrimination on adolescent well-being are apparent, mediated through changes in nutritional and sleep behaviors. These results extend previous research, which predominantly focused on substance use, showing that perceived discrimination also predicted less protective health behaviors. Addressing discrimination and supporting healthy behaviors are promising pathways to promote well-being in adolescents affected by discrimination and mitigate long-term health disparities.

Introduction

The increasing globalization and rising national wealth in European countries paradoxically contribute to increased social inequality and health disparities among adolescents (Elgar et al., 2015; Lang & Tavares, 2023). Adolescence is a crucial foundation for health throughout life: Although noncommunicable chronic diseases—major contributors to premature mortality—typically manifest later in life, their development is significantly influenced by well-being and health behaviors established during adolescence (Santelli et al., 2015). To effectively address social inequalities in health, understanding underlying mechanisms is essential. Discrimination is a key factor through which social disadvantage exacerbates health inequalities (Bauer & Scheim, 2019), particularly chronic and pervasive forms of discrimination (Emmer et al., 2024). Adolescents affected by inequality experience multiple instances of discrimination daily (English et al., 2020). Importantly, discrimination impacts health and well-being both directly and indirectly through its adverse effects on health behaviors (Pascoe et al., 2022). Adolescent health behaviors tend to progress into adulthood, likely amplifying disparities in adolescent health behaviors over the lifespan (e.g., Viner et al., 2012). A better understanding of the adverse effects of discrimination on adolescent well-being and the role of (protective and risky) health behaviors can substantially contribute to identifying ways to mitigate health disparities. We focus on well-being as a broad outcome because it encompasses both mental and somatic health and is more prone to differences in adolescence than specific illnesses, which are more likely to manifest later in life.

Discrimination and Well-Being in Adolescence

Discrimination describes the unfair or prejudicial treatment of people based on their actual or perceived affiliation to marginalized social groups (e.g., ethnicity, gender, or social class; e.g., Emmer et al., 2024). Discrimination comes in several forms. Structural or institutionalized discrimination includes policies or institutional practices that perpetuate

inequality and impact well-being by restricting access to resources and increasing stress exposure (Krieger, 2012). Individual discrimination involves direct social interactions that can be overt or more subtle, such as microaggressions (Emmer et al., 2024). Interpersonal discrimination, such as social rejection, undermines well-being by threatening basic psychological needs, such as the need to belong (Smart Richman & Leary, 2009).

Discrimination is a psychosocial stressor that elicits physiological and psychological stress responses, leading to diminished well-being and long-term health disparities (Emmer et al., 2024).

An especially vulnerable phase for the adverse effects of discrimination is adolescence: Adolescents have limited abilities to cope effectively with discrimination because their self-regulation and coping capabilities are still under development (Compas et al., 2017). Further, due to neural changes in the developing brain, adolescents exhibit a heightened responsiveness to social evaluation and rejection (Somerville, 2013). Meta-analyses have indicated stronger associations between perceived discrimination and well-being for adolescents than adults (e.g., Schmitt et al., 2014). Importantly, longitudinal evidence remains limited because most studies were cross-sectional, conducted in the United States, and predominantly focused on racial discrimination (Cave et al., 2020).

Health Behaviors as Pathways for the Adverse Well-Being Effect of Discrimination

Health behaviors are strongly socially patterned and crucial determinants of morbidity and premature mortality (Petrovic et al., 2018). Key health behaviors include protective behaviors, such as physical activity, nutrition behavior, and sleep, and avoiding risky behaviors, such as alcohol, cigarette, or illicit drug use (Conner, 2001). Engaging in physical activity promotes well-being and resilience among adolescents (Janssen & LeBlanc, 2010), whereas physical inactivity significantly increases the risk for cardiometabolic and mental health problems (van Sluijs et al., 2021). Breakfast consumption, an important indicator of nutrition adequacy (Barr et al., 2014), is associated with better well-being and reduced mental

distress in adolescents (Lien, 2007). A longer sleep duration is associated with better well-being and healthy development (Matricciani et al., 2019). Substance use during adolescence undermines well-being owing to impaired neurodevelopment and increased predisposition to mental health disorders (Chaiton et al., 2009; Steinberg, 2015).

General psychosocial stress longitudinally predicts decreased physical activity, less healthy eating behaviors and nutrition patterns, impaired sleep, and increased substance use in adults (Mouchacca et al., 2013; Yap et al., 2019). Discrimination, as a specific form of psychosocial stressor, affects health behaviors through several unique pathways, including constrained access to resources at both individual and institutional levels. This can manifest, for example, as a lack of safe spaces for physical activity (Jones et al., 2017) or a higher exposure to addictive substances and unhealthy eating options in socially disadvantaged areas (Schneider & Gruber, 2013). Moreover, individuals frequently use unhealthy behaviors, such as stress-induced eating or substance use, as a form of self-medication to mitigate adverse physiological and psychological stress responses triggered by discrimination (Brown et al., 2022; Gibbons et al., 2018). These behaviors can lead to negative long-term health outcomes, including disorders related to overweight and addiction. Attempts to regain a sense of belonging compromised by discrimination can lead to increased substance use because consuming substances is often a social activity (Smart Richman & Leary, 2009).

Discrimination was associated with an increase in risky health behaviors and a decrease in protective health behaviors in a recent meta-analysis (Pascoe et al., 2022). Most identified studies focused on risk behaviors; the few studies examining adolescents exclusively focused on substance use as outcome and were mute on protective health behaviors. Further, the identified studies were predominantly cross-sectional and observational. In the few longitudinal studies, health behaviors—again, mostly substance use—have been examined as mediators explaining the effect of discrimination on well-being (review by Cave et al., 2020). For instance, Yang et al. (2019) found that adolescents

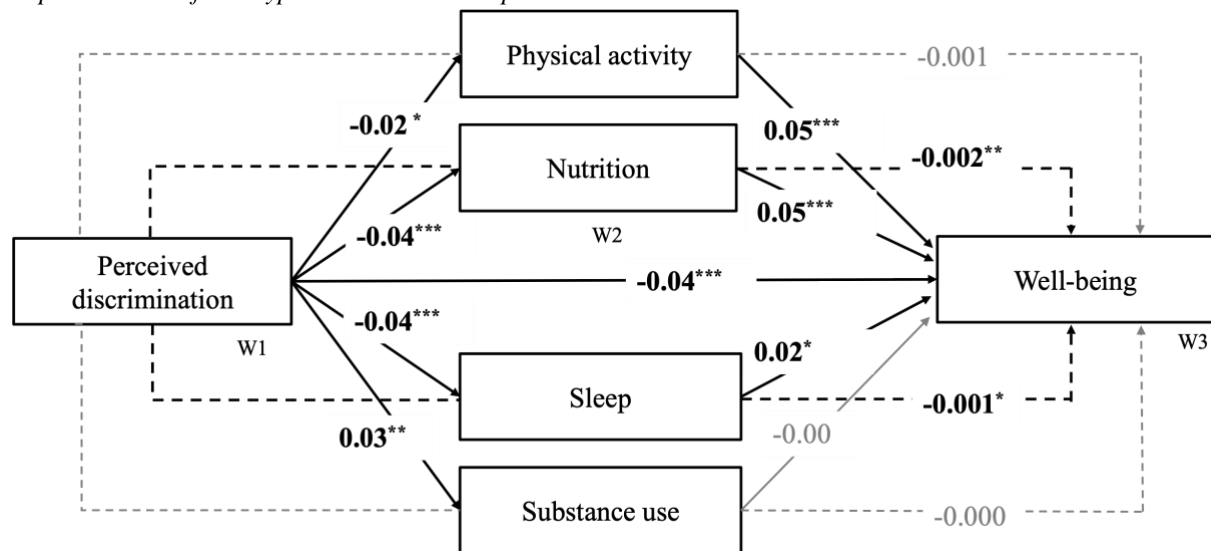
subjected to discrimination were more likely to engage in substance use in early adulthood, which compromised their overall physical and psychological health by midadulthood. Another longitudinal study (Gibbons et al., 2018) found early discrimination linked to worse well-being and smoking from adolescence into adulthood. In summary, only a few longitudinal studies have explored health behaviors as pathways for the negative effects of discrimination on well-being in adolescents, and these have ignored protective health behaviors. The impact of discrimination on health behaviors during adolescence is pivotal, as it can exacerbate lifelong health disparities. Adolescent health behaviors not only affect concurrent well-being and health outcomes but also have long-term impacts on health in adulthood (Burdette et al., 2017) and shape health behavior patterns that often persist into adulthood (Viner et al., 2012).

Study Aims and Hypotheses

Adolescence is a window of opportunity in which to mitigate the negative effects of discrimination on health and health behaviors and, ultimately, to prevent health disparities. To effectively do so, the current research gap needs to be addressed and the long-term consequences of discrimination on adolescent well-being and how—particularly protective—health behaviors mediate this effect over time require study. Moreover, forms of discrimination beyond racial discrimination and within the European context have rarely been studied. We addressed these gaps by examining how perceived discrimination affects well-being and health behaviors over time and investigated the mediating role of health behaviors across four European countries. We propose the following hypotheses: (1) Perceived discrimination is negatively related to well-being 2 years later. (2) Perceived discrimination is negatively related to protective health behaviors, namely, (a) physical activity, (b) nutrition, and (c) sleep, and positively related to risky health behaviors, namely, (d) substance use, 1 year later. (3) Health behaviors, namely, (a) physical activity, (b) nutrition, (c) sleep, and (d) substance use, mediate the relationship between perceived discrimination and well-being over

time. For a graphical representation of the hypotheses and the proposed theoretical model, see Figure 2.1.

Figure 2.1
Representation of the Hypotheses and the Proposed Theoretical Model



Note. Standardized path estimates, β , are shown. Solid lines indicate direct paths (Hypotheses 1 and 2). Dashed lines indicate indirect paths (Hypothesis 3a–d). Black and bold = Significant paths that were in line with our hypotheses. Correlations between the health behaviors and paths from control variables on the mediators and well-being were specified in our analyses but omitted from the figure for clarity reasons (covariances of mediators can be found in Table S2.4). W1, W2, and W3 = First, second, and third measurement wave, respectively.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Method

Data and Sample Characteristics

Data from the multinational Children of Immigrants Longitudinal Survey in Four European Countries panel (CILS4EU; Kalter et al., 2016a, 2016b, 2017) were analyzed. CILS4EU is a comprehensive panel on migration in adolescents in four European societies: England, Germany, the Netherlands, and Sweden. This panel makes it possible to explore a central and widespread dimension of health inequality—migration—among adolescents in Europe on an unprecedented scale. Data collection involved standardized self-report questionnaires completed by the adolescents, one of their parents, and one of their teachers, utilizing paper-and-pencil, telephone, and online formats to allow for flexible and comprehensive data collection. Three stages were used for sampling: (1) Schools were categorized and selected on the basis of the proportion of students with a migration background, with those schools having a higher proportion being oversampled; (2) within each selected school, two classes primarily consisting of 14-year-old students were randomly selected and surveyed; and (3) all students within these classes were included in the sample. For this study, data from the first three annual waves of the survey (starting with Wave 1 in 2010–2011) were used because the age of the sample at Wave 1 was 14–15 years, a period in which individuals are vulnerable to adverse discrimination effects and are establishing health behavior patterns. Furthermore, the three separate measurement points allow for temporally separating predictor, mediator, and outcome variables. Although this design does not establish causality in the same way as experimental studies, it provides a stronger basis for causal inference than cross-sectional designs (O’Laughlin et al., 2018) and establishes temporal precedence between variables, which reduces common method bias (Podsakoff et al., 2024). Table 2.1 summarizes all sample characteristics. The mean age of the sample at Wave 1 was 14.90 years ($SD = 0.54$), and approximately half of the participants (53.5%) identified as girls.

For the longitudinal analysis, we included only participants who completed all three measurement waves, that is, 9,957 (53%) of the 18,716 adolescents surveyed at Wave 1. We systematically explored differences between participants who completed all three waves and those who did not (see Table S2.1 for detailed results). Although the statistical tests revealed significant differences between the two groups across several measures, likely owing to the large sample size, the mean differences were usually very small in terms of effect sizes (Cohen's *d*). The most notable differences were that the largest proportion of completers came from Germany and the largest proportion of dropouts from Sweden. Also, 53.5% were girls among the completer sample, among the dropouts, 45.4%. About 5% more dropouts than completers had a migration background and minority religion affiliation. Concerning health behaviors, the most notable difference was in substance use, where dropouts' reported use was 0.13 points higher on a 4-point scale.

Table 2.1*Sample Characteristics*

Characteristic	Wave 1	Wave 2	Wave 3
Survey country			
Germany	32.7%		
England	22.4%		
Netherlands	22.6%		
Sweden	22.3%		
Age (13–18 years at Wave 1; <i>M, SD</i>)	14.90 (0.57)		
Gender (% girls)	53.5%		
Socioeconomic status			
Parents' occupational status (0–90; <i>M, SD</i>)	52.73 (22.26)		
Subjective material deprivation (0–4; <i>M, SD</i>)	0.45 (0.66)		
Migration status (% with migration background)	38.4%		
Religious affiliation (% minority religion)	21.2%		
Perceived discrimination (0–3; <i>M, SD</i>)	0.25 (0.36)		
Health behaviors (Wave 1)			
Frequency of physical activity (scale 0–4; <i>M, SD</i>)	2.52 (1.16)	2.58 (1.13)	
Frequency of having breakfast (scale 0–4; <i>M, SD</i>)	3.41 (1.07)	3.41 (1.06)	
Hours of sleep (hours; <i>M, SD</i>)	7.95 (1.19)	8.24 (1.06)	
Frequency of substance use (scale 0–4; <i>M, SD</i>)	0.44 (0.65)	0.60 (0.75)	
Well-being (1–10; <i>M, SD</i>)	7.73 (1.92)	7.79 (1.95)	7.77 (1.68)

Note. Parents' occupational status was assessed with the interval-scaled International Socio-Economic Index of occupational status (ISEI; Ganzeboom, 2010), with higher values indicating higher occupational status and, thus, higher socioeconomic status. Higher values of subjective material deprivation indicate higher material deprivation and, thus, lower socioeconomic status.

Measures

Perceived Discrimination

For our analyses, we used perceived discrimination from Wave 1. The frequency of perceived discrimination was assessed using four items, each beginning with “How often do you feel discriminated against or treated unfairly...” followed by “in school,” “in trains, buses, trams, or the subway,” “in shops, stores, cafés, restaurants, or nightclubs,” and “by police or security guards.” Participants responded on a 4-point scale with 0 = *never*, 1 = *sometimes*, 2 = *often*, and 3 = *always*. The mean score across these four items was calculated to quantify the average level of discrimination (Cronbach’s $\alpha = .65^5$; see Table S2.2 and Figure S2.1 for descriptives of the separate items).

Health Behaviors

We used health behavior measurements from Waves 1 and 2 in our analyses.

Protective Health Behaviors. Physical activity and nutrition were assessed with a single item measuring their respective frequency (“How often do you...” “do sports or go to the gym”/“have breakfast?”) with answers on a 5-point Likert scale, with 0 = *never*; 1 = *less often* [than once a month], 2 = *once or several times a month*, 3 = *once or several times a week*, and 4 = *every day*. Sleep was operationalized as hours of sleep on a typical school day (“On a typical school night, how many hours of sleep do you get?”). In Wave 1, this was an open-ended question; in Wave 2 any sleep duration exceeding 12 hr was coded as 12 hr. For consistency, we applied this coding to Wave 1 (affecting 0.2% of the Wave 1 sample, i.e., $n = 17$ adolescents). Outliers in sleep duration were identified using boxplot analysis. Extreme

⁵ Because of the relatively low reliability, we conducted a confirmatory factor analysis with all four items loading on one factor. The model showed a good fit, $\chi^2(2) = 37.430$, $p < .001$, root-mean-square error of approximation (RMSEA) = 0.043, standardized root-mean-square residual (SRMR) = 0.014, comparative fit index (CFI) = 0.993, Tucker–Lewis index = 0.980, indicating the appropriateness of using a mean score across all four life domains. Ideally, one would show that the single-factor model fits the data better than a model with four factors (one for each life domain). Unfortunately, such a model comparison was not possible as discrimination in each life domain was assessed with only a single item. Therefore, we did a robustness check with all discrimination items separately as predictors, as it remains debatable whether using a mean index indicator is adequate.

values with less than 4 hr of sleep on a typical school night (0.3% of the Wave 1 sample and 0.6% of the Wave 2 sample) were coded as missing values.

Risky Health Behaviors. Given our theoretical assumptions that discrimination affects the frequency of alcohol, cigarette, and illicit drug use similarly and impacts well-being through comparable mechanisms, we combined the three respective items (“How often do you... drink alcohol/smoke cigarettes/do drugs?”) into a mean score for substance use (Cronbach’s $\alpha_{\text{Wave1}} = .65$ and $\alpha_{\text{Wave2}} = .65$). Responses were given on 5-point Likert scales of 0 (*never*) to 4 (*every day*); see Table S2.2 for descriptive statistics for the separate items.

Well-Being

Well-being was operationalized as life satisfaction using the item: “On a scale from 1 to 10 where 1 is very unsatisfied and 10 is very satisfied, how satisfied are you with your life in general?” For our analyses, we used the life satisfaction measures from Waves 1 and 3.

Control Variables

Age. We calculated respondents’ age by subtracting their birth month and year from the month and year the survey was administered.

Gender. Gender was assessed with “Are you a boy or a girl?” using two response categories: boy (reference group) and girl.

Socioeconomic Status. **Socioeconomic status** was operationalized as parents’ occupational status (objective indicator) and adolescents’ self-reported subjective material deprivation (subjective indicator). Both indicators had unique effects on well-being and health behaviors; multicollinearity was not observed. Parents provided their occupational status, which was coded according to the 2008 International Standard Classification of Occupations and converted to the interval-scaled International Socio-Economic Index of occupational status (ISEI; Ganzeboom, 2010). The ISEI is a complex indicator combining information about job position, income, and education to reflect the status of an occupation, ranging up to a value of 90 (e.g., for judges; Ganzeboom, 2010). If these data were missing in the parent’s

questionnaire, respective data were taken from the child's questionnaire. For two-parent homes, the higher of the two parents' ISEI scores was used as a measure of parents' occupational status. If both parents (or one parent in single-parent homes) were not employed or had never worked before, the value 0 was assigned. Higher scores represented a higher occupational and, thus, higher socioeconomic status. Subjective material deprivation was assessed by asking adolescents whether they missed out on activities with their friends because they could not afford them; answers were given on a scale of 0 (*never*) to 4 (*always*), with higher values representing lower socioeconomic status.

Migration. In this analysis, migration status was assigned as 0 (no migration background; reference group) or 1 (migration background, including first migration generation, i.e., adolescents who migrated themselves, and second migration generation, i.e., adolescents born in the survey country with at least one parent born abroad).

Religion. Religious affiliation was assessed with one question ("What is your religion?") and answers were coded into three categories: no religion (30.9% of adolescents in Wave 1), Christianity as the majority religion in the four European countries (46.6%), and all other religions combined into a single "minority religion" category, including Islam (16.2%), Hinduism (1.3%), Sikhism (0.9%), Buddhism (0.6%), Judaism (0.1%), and other religions (3.4%).

Analytic Strategy

We used path analysis in R with the lavaan package (Rosseel, 2012) to test our hypotheses. We used all data available and handled missing data with full information maximum likelihood estimation (Newman, 2014). We modeled a direct path from perceived discrimination at Wave 1 to well-being at Wave 3 (Hypothesis 1), from perceived discrimination at Wave 1 to health behaviors at Wave 2 (Hypothesis 2a–d), and from health behaviors at Wave 2 to well-being at Wave 3. Additionally, we modeled paths from the control variables (age, gender, parents' occupational status, subjective material deprivation,

migration, and religion) to health behaviors and well-being. Furthermore, we modeled paths from the health behaviors at Wave 1 to the health behaviors at Wave 2 and a path from well-being at Wave 1 to well-being at Wave 3 to control for baseline levels of the health behaviors and well-being. Last, we allowed correlations between the four health behaviors. To calculate indirect effects from perceived discrimination to well-being via health behaviors (Hypothesis 3a–d), we used unstandardized path estimates from lavaan (Rosseel, 2012) and computed confidence intervals using the Monte Carlo method with 20,000 simulations (Selig & Preacher, 2009).

Robustness Checks

Multilevel Structure. To account for the multilevel structure of our data—students (Level 1) nested within schools (Level 2) nested within countries (Level 3)—we reanalyzed our data in a multilevel path model. Intraclass correlation coefficients (ICCs) indicated that the majority of variance was located at the participant level (Level 1) across all measures, with relatively small proportions of variance attributable to differences between schools (ranging from 1.22% for life satisfaction to 7.04% for substance use) and between countries (from 0.77% for life satisfaction to 9.43% for perceived discrimination). For an overview of ICCs, see Table S2.3. Given these low ICCs, we have opted to present one-level models in the manuscript to reduce the complexity of the analyses. We report the multilevel path model as a robustness check for completeness and transparency in the supplemental materials (Tables S2.5 and S2.6). Importantly, we did not conduct a path model with three levels because of the small proportion of variance between countries and the very small sample size on the third level with only four countries (below the recommended sample size of at least 10; Snijders & Bosker, 1999, p. 44). Initially, we wanted to control for the country level by using dummy variables as control variables for the paths at the school level, but these path models did not converge. Consequently, we replicated the path model used in our main analyses (Hypotheses 1–3) in a two-level path analysis (Preacher et al., 2010). Because our hypotheses all focused

on adolescents (Level 1), we modeled all paths on the student level with school-mean-centered predictors and mediators and decomposed the well-being variance on both the student and school levels.

Perceived Discrimination Across Different Life Domains. The rather low Cronbach's alpha of perceived discrimination indicated that experiencing discrimination in one life domain does not necessarily mean experiencing discrimination in other life domains, questioning the use of a mean index score. To test whether the result patterns replicate by life domain, we replaced the discrimination mean score in the initial path model with four separate discrimination variables for each life domain. Due to convergence problems when including all four discrimination variables in a single path model, we used a segmented approach with four separate path models.

Results

Descriptives

Table 2.1 provides a summary of all descriptives. Most of the adolescents' parents fell within the middle range of the ISEI, and most adolescents indicated no material deprivation (see Figure S2.1). Around 40% of the adolescents had a migration background, and around 20% aligned themselves with a minority religion. Half of the adolescents reported not having encountered discrimination in any of the four life domains assessed, that is, school, public transportation, retail and hospitality, and law enforcement and security (Figures S2.1 and S2.3). Most adolescents reported high well-being (Figure S2.4), as well as engaging in physical activity at least several times a week, eating breakfast daily, and sleeping 8 hr on a typical school day. Risky health behaviors were relatively rare: Most adolescents reported never consuming alcohol, cigarettes, or drugs (Figure S2.5).

Hypothesis Testing

The path model showed a statistically significant chi-square value, $\chi^2(20, N = 9,957) = 175.202, p < .001$, indicating a misfit of the model. However, because the χ^2 value is sensitive to sample size (Bentler & Bonett, 1980), it usually indicates a misfit when using large samples, as in this study. Importantly, the RMSEA (0.028), SRMR (0.011), and CFI (0.990) all indicated a good model fit (Hu & Bentler, 1995). The estimated model parameters were thus interpretable.

The results of the path model are presented in Table 2.2 (direct effects) and Table 2.3 (indirect effects); see Figure 2.1 for a graphical overview. The first hypothesis, perceived discrimination is negatively related to well-being 2 years later, was supported by the negative and significant path estimate from perceived discrimination to well-being ($\beta = -.04, p < .001$). Hypothesis 2a–c, perceived discrimination is negatively related to (a) physical activity, (b) nutrition, and (c) sleep 1 year later, was supported (physical activity: $\beta = -.02, p = .049$; nutrition: $\beta = -.04, p < .001$; sleep: $\beta = -.04, p < .001$). Hypothesis 2d, perceived discrimination is positively related to substance use 1 year later, was also supported ($\beta = .03, p = .002$).

Hypothesis 3, health behaviors mediate the relationship between perceived discrimination and well-being, was partially supported (Table 2.3). We found no support for the hypothesis that perceived discrimination is indirectly negatively related to well-being 2 years later via physical activity (Hypothesis 3a) or substance use (Hypothesis 3d) 1 year later. The indirect effects of perceived discrimination on well-being 2 years later via nutrition (Hypothesis 3b) and sleep (Hypothesis 3c) were significant and negative.

Table 2.2
Results of Path Analysis: Direct Effects

Variable	Physical activity (W2)	Nutrition (W2)	Sleep (W2)	Substance use (W2)	Well-being (W3)
Age	-.03** (.02)	.02 [†] (.02)	-.01 (.02)	.04*** (.01)	.01 (.03)
Gender (ref. male)	-.10*** (.02)	-.01 (.02)	.06*** (.02)	-.05*** (.01)	-.08*** (.03)
Parents' occupational status (ISEI)	.04*** (.00)	.03** (.00)	.03** (.00)	.03** (.00)	-.03* (.00)
Subjective material deprivation	-.03** (.02)	.00 (.01)	.00 (.02)	.00 (.01)	-.06*** (.03)
Migration status (ref. natives)	-.03** (.03)	-.05*** (.02)	-.07*** (.03)	-.05*** (.02)	.00 (.04)
Religious affiliation (ref. no/majority)	-.01 (.03)	.00 (.03)	.02 [†] (.03)	-.06*** (.02)	.02* (.05)
Physical activity (W1)	.51*** (.01)				
Nutrition (W1)		.59*** (.01)			
Sleep (W1)			.36*** (.01)		
Substance use (W1)				.64*** (.01)	
Well-being (W1)					.28*** (.01)
Perceived discrimination (W1)	-.02* (.03)	-.04*** (.02)	-.04*** (.03)	.03** (.02)	-.04*** (.05)
Physical activity (W2)					.05*** (.01)
Nutrition (W2)					.05*** (.02)
Sleep (W2)					.02* (.02)
Substance use (W2)					.00 (.02)

Note. $N = 9,957$ adolescents. The table shows standardized path estimates, β , with standard errors in parentheses. Control variables in the model included age, gender (reference group: male), parents' occupational status (measured by the International Socio-Economic Index [ISEI] of occupational status, range 0–90; higher values indicate higher occupational status and thus higher socioeconomic status), subjective material deprivation (scale of 0–4; higher values indicate higher material deprivation and thus lower socioeconomic status), migration status (reference group: natives), and religious affiliation (reference group: no religion and majority religion).

Coefficients with p values $< .05$ are highlighted in bold for emphasis. Ref. = reference group.

W1, W2, and W3 = First, second, and third measurement wave, respectively.

[†] $p < .01$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2.3*Results of Path Analysis: Indirect Effects*

Path	β	95% CI
Perceived discrimination → Physical activity → Well-being	-0.001 (.002)	[-0.008, 0.000]
Perceived discrimination → Nutrition → Well-being	-0.002 (.003)	[-0.016, -0.005]
Perceived discrimination → Sleep → Well-being	-0.001 (.002)	[-0.010, -0.006]
Perceived discrimination → Substance use → Well-being	-0.000 (.001)	[-0.003, 0.002]

Note. β = standardized path estimate; CI = confidence interval computed using the Monte-Carlo Method with 20,000 simulations (Selig & Preacher, 2009). Confidence intervals that do not include zero are shown in bold. Standard errors are shown in parentheses.

Robustness Checks

Multilevel Structure. The two-level path model with students (Level 1) nested in schools (Level 2) showed a statistically significant chi-square value, $\chi^2(20, N = 9,957) = 191.549, p < .001$, as can be expected given the large sample size (Bentler & Bonett, 1980). Yet the RMSEA (0.029), SRMR_{within} (0.012), SRMR_{between} (0.000), and CFI (0.987) all indicated a good model fit (Hu & Bentler, 1995), and we therefore interpreted the estimated model parameters. The results of the two-level path model are presented in Table S2.5 (direct effects) and Table S2.6 (indirect effects). The results are comparable to the findings from the one-level path model reported for Hypotheses 1–3 above, with the one exception that the relationship between perceived discrimination and physical activity 1 year later did not remain significant. Notably, this path was also close to the cut-off value for interpreting the path as nonsignificant in the one-level model ($p = .049$).

Perceived Discrimination Across Different Life Domains. For findings from the robustness checks separately for the four life domains of discrimination, see Table S2.7. The relationships of perceived discrimination in the school context with well-being and health behaviors mirrored the pattern observed for the mean score of perceived discrimination. For discrimination in the other three life domains (public transportation, retail and hospitality, and law enforcement and security), the results pattern remained similar, but some paths between perceived discrimination and physical activity, sleep, and substance use became statistically nonsignificant. The indirect effect via sleep was significant for discrimination in public transportation and law enforcement contexts, but not in the school or retail context. The effects of perceived discrimination on nutrition and well-being were significant and robust across all life domains, supporting our main analyses.

Discussion

This large panel study of adolescents across four European countries over 3 years showed that higher perceived discrimination predicts poorer well-being 2 years later. It also shows that discrimination is related to engaging less in protective (physical activity, nutrition, and sleep) and more in risky (substance use) health behaviors 1 year later and that nutrition and sleep partially explain the longitudinal relation between discrimination and well-being. Adolescents reported experiencing discrimination more frequently within the school environment than in other life domains.

Interpretation of Findings

Our finding that perceived discrimination in adolescents predicts well-being 2 years later (Hypothesis 1) extends previous research from the United States (e.g., Cave et al., 2020) to the European context and broadens the focus from racial discrimination to a wider spectrum of discrimination types. Also, whereas previous studies examined substance use as a consequence of discrimination (e.g., Cave et al., 2020; Pascoe et al., 2022), the current study additionally investigated the relation between discrimination and protective health behaviors, that is, physical activity, nutrition, and sleep (Hypothesis 2a–d). Of note, the association between perceived discrimination and physical activity 1 year later was not robust. This is in line with cross-sectional findings in adults (Figueroa et al., 2024) in which perceived social class discrimination was also not associated with physical activity but was associated with nutrition, sleep, and substance use. This study, like ours, used a single-item measure for physical activity, which, due to limited measurement quality and limited variance in our study, could explain the nonsignificant effect. Consequently, we also did not find physical activity to explain the relationship between perceived discrimination and well-being (Hypothesis 3a). Whereas nutrition and sleep partially explained the link between discrimination and well-being (Hypothesis 3b and c), substance use did not (Hypothesis 3d). This is particularly noteworthy because substance use has been the primary focus for explaining the link between perceived

discrimination and well-being among adolescents in previous research (see review by Cave et al., 2020). In the current study, higher perceived discrimination was related to higher substance use 1 year later, but substance use did not explain well-being the following year. This might be because of a generally low reported frequency of substance use, possibly influenced by social desirability bias in school-based self-reports, or selective dropout of adolescents reporting higher substance use. The role of nutrition and sleep in explaining how discrimination impairs well-being over time has not been previously researched. They might therefore be particularly relevant and interesting to the field and nicely complement a recent study showing that the relation between peer bullying in childhood and mental health in late adolescence was explained by physical activity, nutrition, and sleep in middle adolescence (Tsomokos & Slavich, 2024). Importantly, protective health behaviors might have the potential also to reduce the negative impact of psychosocial stressors (e.g., Flueckiger et al., 2016); hence, the adverse effect of discrimination on protective health behaviors may further exacerbate its adverse effects on well-being and health.

Importantly, all our analyses controlled for age, gender, socioeconomic status, migration status, and religious affiliation because these are key determinants of health behaviors and well-being. Acknowledging these variables as central indicators of social inequality and potential discrimination, all current findings thus reflect the impact of subjective discrimination on health and well-being beyond objective social inequality indicators. The findings underscore that merely capturing objective indicators of inequality fails to address the full impact of discrimination.

We explored the impact of perceived discrimination across various life domains separately—school, public transportation, retail and hospitality sectors, and interactions with law enforcement and security. The most robust and consistent effects on well-being and health behaviors were observed in the school context. This finding may be attributable to adolescents spending a large proportion of their time at school or the higher frequency of discrimination

incidents reported in educational settings compared to other areas. Empirical evidence shows that discrimination by educators increases from early to midadolescence (Hughes et al., 2016). Prevention of discrimination in the school environment could have long-term benefits for well-being and health behaviors. At the same time, other public life domains should not be overlooked—consistent negative effects on well-being and nutrition behavior were identified for all investigated domains. These may intensify as adolescents age and gain more exposure to them.

Limitations and Future Research

An essential strength of this study is its large sample of adolescents, including a large proportion of hard-to-reach adolescents with a migration background. This research covers an especially vulnerable stage for the negative impacts of perceived discrimination during mid to late adolescence. It is among the first studies of its magnitude to explore perceived discrimination in a European context, covering a wide range of discrimination types as well as protective health behaviors in addition to substance use. Although observational, the longitudinal design across three yearly waves enhances the potential for causal conclusions (O’Laughlin et al., 2018) and mitigates common method bias (Podsakoff et al., 2024).

Although this data set is comprehensive, it has some limitations: The dropout rate was about 47% and possibly selective, with adolescents reporting higher substance use being less likely to participate across all three assessment waves. To model the data from participants of all three assessment waves optimally and handle missing data, we employed full information maximum likelihood estimation. This statistical technique allows for including all available data, providing a more accurate representation than excluding cases with missing information (Newman, 2014).

As is common for panel studies, the variables in the current panel were often rather broadly assessed with a few items, for example, perceived discrimination, well-being, and health behaviors. Assessing perceived discrimination is particularly challenging because the

most frequent forms of discrimination in daily life are subtle and ambiguous and, hence, harder to recognize as discrimination (cf. Emmer et al., 2024). Importantly, discrimination negatively impacts health, regardless of whether the individual consciously recognizes it as such (Bailey et al., 2017). Additionally, the items used in the study assessed the frequency of discrimination or unfair treatment. It is important to distinguish that not all instances of unfair treatment equate to discrimination. The meta-analysis by Emmer et al. (2024) illustrated that unfair treatment based on nonmarginalized social group affiliation (e.g., men experiencing unfair treatment because of gender) did not have negative well-being effects in experimental studies, unlike unfair treatment based on marginalized group affiliation (e.g., women experiencing sexism). This emphasizes that discrimination, beyond its overt manifestation in unfair treatment, is deeply entwined with societal structures, cultural prejudices, and power dynamics (Emmer et al., 2024), which this study could not account for. It could enhance our understanding of explanations for discrimination and health further if future studies included more comprehensive measures of psychosocial aspects of discrimination experience, such as the intensity of the stress response (Krieger, 2012). Additionally, adopting more comprehensive well-being measures that capture dimensions such as competence, emotional stability, engagement, positive relationships, resilience, and self-esteem (Ruggeri et al., 2020) could provide a broader perspective on the adverse effects of discrimination. Nevertheless, the life satisfaction item used in the current study is a widely accepted and validated measure for life satisfaction (Cheung & Lucas, 2014). Similarly, future panel research could benefit from using more complex measures for health behavior, including more informative dimensions of physical activity, such as activity type, duration, or intensity (Ainsworth et al., 2015), healthfulness of breakfast and specific nutrients consumed or comprehensive dietary patterns (Tucker, 2010), or measures such as sleep quality or sleep disturbances (Slopen et al., 2016) for more accuracy. Such measures could also reduce bias from retrospective recall and self-reporting. Measuring substance use is particularly challenging, especially considering that the

survey was conducted at schools and substance use among adolescents is illegal in the surveyed countries, potentially affecting the honesty of responses.

In sum, the broad measurements, coupled with the comparably long yearly time intervals between survey waves and the potentially selective sample of adolescents across four countries, may have contributed to underestimating the effects identified in this study and may explain the small effect sizes. However, given that discrimination is a chronic psychosocial stressor and the negative effects of discrimination on health accumulate over the lifespan (Reskin, 2012), even small effects pose a considerable threat to health and mortality. In particular, the adverse effects on health behaviors not only impact current well-being but also influence future health because adolescence is a critical period for establishing health behavior patterns that can persist over the lifespan, potentially exacerbating health inequalities and posing a risk to public health and societal equity.

Implications

The results of this study have several implications. First, the findings underscore the importance of focusing on adolescence in research on social inequality, discrimination, and public health because perceived discrimination has long-lasting negative impacts on well-being and health behaviors. Prioritizing early intervention and prevention strategies is key, as they not only improve immediate well-being and health but also stave off long-term health and social inequalities (Santelli et al., 2015). Promising interventions targeting affected adolescents to mitigate the negative effects of discrimination on well-being and health include, for instance, values affirmation and sense of belonging interventions (see Lewis et al., 2015). Additionally, it is crucial to consider interventions to reduce prejudice and discrimination, targeting populations not directly affected by discrimination in particular. A promising approach involves empowering bystanders to actively prevent or stop discriminatory incidents, to support targeted individuals and create a safe and inclusive environment for everyone (Dessel et al., 2017).

Second, to enhance health and diminish health disparities throughout the lifespan, intervention and prevention should also target social contexts. The current study suggests that schools should be especially targeted because this is where most discrimination incidents were reported and the most pronounced effects on well-being and health behaviors were observed. Also, school-based discrimination from peers and educators extends beyond well-being and health to outcomes such as academic performance (Stevens et al., 2018) and social isolation (Doyle & Barreto, 2023). As key public institutions, schools can be particularly effective in reaching disadvantaged populations, which is an ongoing challenge in health prevention and intervention programs.

Third, health behaviors are modifiable and should, therefore, be targeted in prevention and intervention programs because they—particularly protective health behaviors—can mitigate the negative effects of psychosocial stressors (e.g., Flueckiger et al., 2016). To address health behaviors as a modifiable mechanism, future interventions and prevention efforts should target determinants of health behaviors that are impacted by discrimination, such as self-efficacy (Cavaliere et al., 2019), social support (Doyle & Barreto, 2023; Umberson et al., 2010), or maladaptive coping strategies (Brown et al., 2022; Gibbons et al., 2018). Furthermore, programs promoting changes in general health behavior should place a special focus on promoting and maintaining health behaviors in at-risk adolescents. Recognizing health behaviors as both outcomes of discrimination and as protective factors highlights the complexity of addressing health disparities and suggests a multifaceted approach to reducing discrimination exposure and strengthening resilience through positive health behaviors.

Conclusion

This study provides new insights into the long-term effects of discrimination on adolescent well-being and highlights the role of health behaviors in explaining these effects. By identifying specific pathways through which discrimination affects well-being and different discrimination contexts, this research contributes to a more nuanced understanding of health

disparities. Schools emerged as a potential context for addressing health behaviors and mitigating discrimination effects. Adolescence is a strategic window for intervention and prevention efforts to reduce social inequality and promote equitable health outcomes with possible positive consequences across the entire lifespan.

Availability of data and materials

The analysis code and details on data accessibility are available on the Open Science

Framework: <https://osf.io/8he5m/>.

Disclosure of Interest

The authors have no conflicts of interest to disclose.

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CRedit author statement

Christine Emmer played a lead role in conceptualization, data curation, formal analysis, investigation, methodology, project administration, validation, visualization, writing: original draft, and writing: review and editing. Anna Neumer played a lead role in formal analysis and a supporting role in data curation, methodology, and writing: review and editing. Frank Kalter played a lead role in funding acquisition and supervision. Jutta Mata played a lead role in funding acquisition, supervision, and writing: review and editing.

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Supplemental Material

Table S2.1
Dropout Analyses

Variable	Analysis sample (<i>n</i> = 9,957)	Incomplete participation (<i>n</i> = 8,759)	Statistical test results ^a
Survey country			$\chi^2(3, N = 18,716) = 452.75^{***}$
Germany	32.7%	20.0%	
England	22.4%	23.8%	
Netherlands	22.6%	24.2%	
Sweden	22.3%	32.0%	
Age (13–18 years; <i>M, SD</i>)	14.90 (0.57)	14.95 (0.60)	$t(17,862) = 5.86^{***}; d = .087$
Gender (% girls)	53.5%	45.4%	$\chi^2(1, N = 18,711) = 122.96^{***}$
Parents' occupational status (0–90; <i>M, SD</i>)	52.73 (22.26)	51.13 (21.85)	$t(13,705) = -4.35^{***}; d = -.072$
Subjective material deprivation (0–4; <i>M, SD</i>)	0.45 (0.66)	0.49 (0.69)	$t(16,440) = 3.8797^{***}; d = .060$
Migration status (% with migration background)	38.4%	43.6%	$\chi^2(1, N = 18,631) = 52.645^{***}$
Religious affiliation (% minority religion)	21.2%	26.7%	$\chi^2(1, N = 18,488) = 42.565^{***}$
Perceived discrimination (0–3; <i>M, SD</i>)	0.25 (0.36)	0.27 (0.40)	$t(17,031) = 3.39^{***}; d = .051$
Health behaviors			
Frequency of physical exercise (scale 0–4; <i>M, SD</i>)	2.52 (1.16)	2.49 (1.22)	$t(15,382) = -1.47; d = -.023$
Frequency of having breakfast (scale 0–4; <i>M, SD</i>)	3.41 (1.07)	3.29 (1.14)	$t(15,229) = -6.64^{***}; d = -.106$
Hours of sleep (hours; <i>M, SD</i>)	7.95 (1.19)	7.92 (1.28)	$t(17,108) = -1.60; d = -.024$
Frequency of substance use (scale 0–4; <i>M, SD</i>)	0.44 (0.65)	0.57 (0.80)	$t(14,371) = 11.20^{***}; d = .180$
Life satisfaction (1–10; <i>M, SD</i>)	7.73 (1.92)	7.83 (1.98)	$t(17,865) = 3.34^{***}; d = .050$

Note. Total *N* = 18,716.

^aWelch's two-sample *t* tests were used for continuous variables, including Cohen's effect size *d*; Pearson's chi-square tests with Yates's continuity correction for categorical variables. All variables were assessed at Wave 1.

p* < .01. *p* < .001.

Table S2.2*Additional Sample Characteristics: Separate Items for Perceived Discrimination and Substance Use*

Characteristic	<i>M (SD)</i>
Frequency of perceived discrimination at Wave 1 (scale 0–3)	
In school	0.51 (0.66)
In public transportation	0.15 (0.43)
In retail and hospitality	0.16 (0.42)
By law enforcement and security	0.20 (0.56)
Frequency of substance use at Wave 2 (scale 0–4)	
Alcohol use	1.10 (1.08)
Cigarette smoking	0.55 (1.23)
Illicit drug use	0.14 (0.57)

Note. Perceived discrimination was assessed with a 4-point scale of 0 (*never*) to 3 (*always*).

Substance use was assessed on a 5-point Likert scale of 4 (*every day*) to 0 (*never*).

Table S2.3
Intraclass Correlation Coefficients

Predictor/Outcome	ICC Level 1 (Participant)	ICC Level 2 (School)	ICC Level 3 (Country)
Perceived discrimination (Wave 1)	87.44%	3.13%	9.43%
Physical activity (Wave 2)	92.66%	5.43%	1.91%
Nutrition (Wave 2)	94.34%	3.66%	2.00%
Sleep (Wave 2)	91.65%	3.60%	4.75%
Substance use (Wave 2)	87.42%	7.04%	5.54%
Life satisfaction (Wave 3)	98.01%	1.22%	0.77%

Note. The table presents intraclass correlation coefficients (ICCs) for the main predictors and outcomes with students (Level 1) nested within schools (Level 2), which are further nested within countries (Level 3).

Table S2.4*Estimated Covariances of Mediator Variables in the Path Model Depicted in Figure 1*

Variable	1	2	3	4
1. Physical activity	—			
2. Nutrition	.10^{***}	—		
3. Sleep	-.01	.09^{***}	—	
4. Substance use	.03^{**}	-.04^{**}	-.13^{***}	—

Note. All variables were assessed at Wave 2. Estimated standardized coefficients, β , are shown.

Coefficients with p values $< .05$ are highlighted in bold for emphasis.

^{**} $p < .01$. ^{***} $p < .001$.

Table S2.5*Results of Two-Level Path Analysis: Direct Effects*

Variable	Physical activity (W2)	Nutrition (W2)	Sleep (W2)	Substance use (W2)	Well-being (W3)
Age	-.02* (.02)	.01 (.02)	-.03** (.02)	.03** (.01)	-.02 (.04)
Gender (ref. male)	-.09*** (.02)	-.02 [†] (.02)	.06*** (.02)	-.04*** (.01)	-.09*** (.03)
Parents' occupational status (ISEI)	.04*** (.00)	.03** (.00)	.02 (.00)	.04*** (.00)	.00 (.00)
Subjective material deprivation	-.02 [†] (.02)	.00 (.01)	.00 (.02)	.00 (.01)	-.05*** (.03)
Migration status (ref. natives)	-.02 (.02)	-.03** (.02)	-.04** (.03)	-.02 [†] (.01)	.00 (.04)
Religious affiliation (ref. no/majority)	.00 (.03)	.01 (.03)	.04** (.03)	-.05*** (.02)	.02 [†] (.05)
Physical activity (W1)	.49*** (.01)				
Nutrition (W1)		.58*** (.01)			
Sleep (W1)			.34*** (.01)		
Substance use (W1)				.62*** (.01)	
Well-being (W1)					.27*** (.01)
Perceived discrimination (W1)	.00 (.03)	-.04*** (.03)	-.02* (.03)	.04*** (.02)	-.06*** (.05)
Physical activity (W2)					.05*** (.02)
Nutrition (W2)					.05*** (.02)
Sleep (W2)					.04*** (.02)
Substance use (W2)					.00 (.03)

Note. $N = 465$ schools, $n = 9,957$ students. The standardized estimates, β , resulted from one model including within-school main effects. Predictor and mediator variables were centered on the school mean. Standard errors are presented in parentheses. In the specified model, covariances between health behaviors were included. Control variables included age, gender (reference group boys vs. girls), parents' occupational status (measured by the interval-scaled International Socio-Economic Index of occupational status [ISEI], range 0–90, with higher values indicating higher occupational status), subjective material deprivation (measured on a scale of 0–4, with higher values indicating greater material deprivation), migration status (reference group natives vs. adolescents with migration history), and religious affiliation (reference group no religion or affiliation with majority religion vs. minority religion affiliation). Coefficients with p values $< .05$ are highlighted in bold for emphasis.

Ref. = reference group. W1, W2, and W3 = First, second, and third measurement wave, respectively.

[†] $p < .01$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table S2.6*Results of Two-Level Path Analysis: Indirect Effects*

Path	β	95% CI
Perceived discrimination → Physical activity → Well-being	-.000 (.002)	[-0.005, 0.004]
Perceived discrimination → Nutrition → Well-being	-.002 (.003)	[-0.014, -0.004]
Perceived discrimination → Sleep → Well-being	-.001 (.002)	[-0.010, -0.003]
Perceived discrimination → Substance use → Well-being	-.000 (.002)	[-0.004, 0.003]

Note. β = standardized path estimate obtained from two-level path analysis; CI = confidence interval computed using the Monte-Carlo Method with 20,000 simulations (Selig & Preacher, 2009). Confidence intervals that do not include zero are shown in bold. Standard errors are presented in parentheses.

Table S2.7
Comparison of the Effects for Different Perceived Discrimination Indicators

Indicator	Physical activity (W2)	Nutrition (W2)	Sleep (W2)	Substance use (W2)	Well-being (W3)
Perceived discrimination mean score	-.02* (.03)	-.04*** (.02)	-.04*** (.03)	.03** (.02)	-.04*** (.05)
Perceived discrimination					
In school	-.03** (.02)	-.03** (.01)	-.05*** (.02)	.02* (.01)	-.04*** (.05)
In public transportation	-.01 (.02)	-.02* (.02)	-.03* (.03)	.01 (.01)	-.04*** (.05)
In retail and hospitality	-.01 (.02)	-.03** (.02)	.00 (.03)	.00 (.01)	-.04*** (.05)
By law enforcement and security	.00 (.02)	-.03*** (.02)	-.02* (.02)	.03** (.01)	-.04*** (.05)

Note. $N = 9,957$ students. This table displays the effects of the mean score of perceived discrimination from the main analysis (see Table 2), and the results from the four additional path models estimated as a robustness check to assess the effects of the separate items of perceived discrimination. The robustness checks were conducted with path models mirroring our approach in the main analyses. For better comparability, the table depicts only the direct paths of perceived discrimination to health behaviors and well-being; for the detailed results and comprehensive display of all coefficients, please refer to Tables 2 and 3 for the main analysis with the mean score and Tables S8–S14 for the additional path models with the separate discrimination items. The table presents standardized path estimates, β , with standard errors in parentheses. Control variables included age, gender, parents' occupational status, subjective material deprivation, migration status, and religious affiliation. Baseline health behaviors and well-being at Wave 1 were controlled to adjust for initial levels. Coefficients with p values $< .05$ are highlighted in bold for emphasis. W1, W2, and W3 = First, second, and third measurement wave, respectively.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table S2.8*Robustness Check: Direct Effects Path Analysis—Perceived Discrimination in School (Item 1)*

Variable	Physical activity (W2)	Nutrition (W2)	Sleep (W2)	Substance use (W2)	Well-being (W3)
Age	-.03*** (.02)	.02 [†] (.02)	-.01 (.02)	.04*** (.01)	.01 (.03)
Gender (ref. male)	-.09*** (.02)	-.01 (.02)	.06*** (.02)	-.05*** (.01)	-.08*** (.03)
Parents' occupational status (ISEI)	.04*** (.00)	.03** (.00)	.04** (.00)	.03** (.00)	-.03* (.00)
Subjective material deprivation	-.03** (.02)	.00 (.01)	.00 (.02)	.00 (.01)	-.06*** (.03)
Migration status (ref. natives)	-.03* (.03)	-.05*** (.02)	-.08*** (.03)	-.05*** (.02)	.00 (.04)
Religious affiliation (ref. no/majority)	-.01 (.03)	.00 (.03)	.02 [†] (.03)	-.06*** (.02)	.02* (.05)
Physical activity (W1)	.51*** (.01)				
Nutrition (W1)		.59*** (.01)			
Sleep (W1)			.36*** (.02)		
Substance use (W1)				.64*** (.01)	
Well-being (W1)					.28*** (.01)
Perceived discrimination in school (W1)	-.03** (.02)	-.03** (.01)	-.05*** (.02)	.02* (.01)	-.04*** (.05)
Physical activity (W2)					.05*** (.01)
Nutrition (W2)					.05*** (.02)
Sleep (W2)					.02* (.02)
Substance use (W2)					.00 (.02)

Note. $N = 9,957$ students. The table presents standardized path estimates, β , with standard errors in parentheses. In the specified model, covariances between health behaviors were included. Control variables included age, gender (reference group boys vs. girls), parents' occupational status (measured by the interval-scaled International Socio-Economic Index of occupational status [ISEI], range 0–90, with higher values indicating higher occupational status and thus higher socioeconomic status), subjective material deprivation (measured on a scale from 0–4, with higher values indicating higher material deprivation and thus lower socioeconomic status), migration status (reference group Natives vs. adolescents with migration history), and religious affiliation (reference group no religion or affiliation with majority religion vs. minority religion affiliation). Coefficients with p -values $< .05$ are highlighted in bold for emphasis. Ref. = reference group. W1, W2, and W3 = First, second, and third measurement wave, respectively.

[†] $p < .01$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table S2.9*Robustness Check: Indirect Effects Path Analysis – Perceived Discrimination in School (Item 1)*

Path	β	95% CI
Perceived discrimination → Physical activity → Well-being	-.001 (.001)	[-0.006, -0.001]
Perceived discrimination → Nutrition → Well-being	-.001 (.001)	[-0.006, -0.001]
Perceived discrimination → Sleep → Well-being	-.001 (.002)	[-0.006, 0.000]
Perceived discrimination → Substance use → Well-being	-.000 (.001)	[-0.001, 0.001]

Note. B = standardized path estimate; CI = confidence interval computed using the Monte-Carlo Method with 20,000 simulations (Selig & Preacher, 2009). Confidence intervals that do not include zero are shown in bold. Standard errors are presented in parentheses.

Table S2.10

Robustness Check: Direct Effects Path Analysis—Perceived Discrimination in Public Transportation (Item 2)

Variable	Physical activity (W2)	Nutrition (W2)	Sleep (W2)	Substance use (W2)	Well-being (W3)
Age	-.03*** (.02)	.01 (.02)	-.02 (.02)	.04*** (.01)	.01 (.03)
Gender (ref. male)	-.10*** (.02)	-.01 (.02)	.06*** (.02)	-.05*** (.01)	-.08*** (.03)
Parents' occupational status (ISEI)	.04*** (.00)	.03** (.00)	.04** (.00)	.03** (.00)	-.03* (.00)
Subjective material deprivation	-.03** (.02)	-.01 (.01)	.00 (.02)	.00 (.01)	-.06*** (.03)
Migration status (ref. natives)	-.03** (.03)	-.05*** (.02)	-.08*** (.03)	-.05*** (.02)	-.00 (.04)
Religious affiliation (ref. no/majority)	-.01 (.03)	.00 (.03)	.02 [†] (.03)	-.06*** (.02)	.02* (.05)
Physical activity (W1)	.51*** (.01)				
Nutrition (W1)		.60*** (.01)			
Sleep (W1)			.36*** (.01)		
Substance use (W1)				.65*** (.01)	
Well-being (W1)					.28*** (.01)
Perceived discrimination in public transportation (W1)	-.01 (.02)	-.02* (.02)	-.03* (.03)	.01 (.01)	-.04*** (.05)
Physical activity (W2)					.04*** (.02)
Nutrition (W2)					.05*** (.02)
Sleep (W2)					.02* (.02)
Substance use (W2)					.00 (.02)

Note. $N = 9,957$ students. The table presents standardized path estimates, β , with standard errors in parentheses. In the specified model, covariances between health behaviors were included. Control variables included age, gender (reference group boys vs. girls), parents' occupational status (measured by the interval-scaled International Socio-Economic Index of occupational status [ISEI], range 0–90, with higher values indicating higher occupational status and thus higher socioeconomic status), subjective material deprivation (measured on a scale of 0–4, with higher values indicating higher material deprivation and thus lower socioeconomic status), migration status (reference group natives vs. adolescents with migration history), and religious affiliation (reference group no religion or affiliation with majority religion vs. minority religion affiliation). Coefficients with p values $< .05$ are highlighted in bold for emphasis. Ref. = reference group. W1, W2, and W3 = First, second, and third measurement wave, respectively.

[†] $p < .01$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table S2.11*Robustness Check: Indirect Effects Path Analysis—Perceived Discrimination in Public Transportation (Item 2)*

Path	β	95% CI
Perceived discrimination → Physical activity → Well-being	-.001 (.002)	[-0.006, 0.001]
Perceived discrimination → Nutrition → Well-being	-.001 (.002)	[-0.008, -0.0002]
Perceived discrimination → Sleep → Well-being	-.001 (.001)	[-0.006, -0.00005]
Perceived discrimination → Substance use → Well-being	.000 (.000)	[-0.001, 0.001]

Note. β = standardized path estimate; CI = confidence interval computed using the Monte-Carlo Method with 20,000 simulations (Selig & Preacher, 2009). Confidence intervals that do not include zero are shown in bold. Standard errors are presented in parentheses.

Table S2.12*Robustness Check: Direct Effects Path Analysis—Perceived Discrimination in Retail and Hospitality (Item 3)*

Variable	Physical activity (W2)	Nutrition (W2)	Sleep (W2)	Substance use (W2)	Well-being (W3)
Age	-.03*** (.02)	.01 (.02)	-.02 (.02)	.04*** (.01)	.01 (.03)
Gender (ref. male)	-.10*** (.02)	-.01 (.02)	.06*** (.02)	-.05*** (.01)	-.08*** (.03)
Parents' occupational status (ISEI)	.04*** (.00)	.03** (.00)	.03** (.00)	.03** (.00)	-.03* (.00)
Subjective material deprivation	-.03* (.02)	-.01 (.01)	.00 (.02)	.00 (.01)	-.06*** (.03)
Migration status (ref. natives)	-.03* (.03)	-.05*** (.02)	-.08*** (.03)	-.05*** (.02)	.00 (.04)
Religious affiliation (ref. no/majority)	-.01 (.03)	.00 (.03)	.02 [†] (.03)	-.06*** (.02)	.02* (.05)
Physical activity (W1)	.51*** (.01)				
Nutrition (W1)		.60*** (.01)			
Sleep (W1)			.36*** (.01)		
Substance use (W1)				.65*** (.01)	
Well-being (W1)					.28*** (.01)
Perceived discrimination in retail and hospitality (W1)	-.01 (.02)	-.03** (.02)	.00 (.03)	.00 (.01)	-.04*** (.05)
Physical activity (W2)					.05*** (.02)
Nutrition (W2)					.05*** (.02)
Sleep (W2)					.02* (.02)
Substance use (W2)					.00 (.02)

Note. $N = 9,957$ students. The table presents standardized path estimates, β , with standard errors in parentheses. In the specified model, covariances between health behaviors were included. Control variables included age, gender (reference group boys vs. girls), parents' occupational status (measured by the interval-scaled International Socio-Economic Index of occupational status [ISEI], range 0–90, with higher values indicating higher occupational status and thus higher socioeconomic status), subjective material deprivation (measured on a scale of 0–4, with higher values indicating higher material deprivation and thus lower socioeconomic status), migration status (reference group natives vs. adolescents with migration history), and religious affiliation (reference group no religion or affiliation with majority religion vs. minority religion affiliation). Coefficients with p values $< .05$ are highlighted in bold for emphasis. Ref. = reference group. W1, W2, and W3 = First, second, and third measurement wave, respectively.

[†] $p < .01$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table S2.13*Robustness Check: Indirect Effects Path Analysis—Perceived Discrimination in Retail and Hospitality (Item 3)*

Path	β	95% CI
Perceived discrimination → Physical activity → Well-being	.000 (.002)	[-0.005, 0.002]
Perceived discrimination → Nutrition → Well-being	-.001 (.002)	[-0.010, -0.001]
Perceived discrimination → Sleep → Well-being	.000 (.001)	[-0.003, 0.002]
Perceived discrimination → Substance use → Well-being	.000 (.000)	[-0.001, 0.001]

Note. β = standardized path estimate; CI = confidence interval computed using the Monte-Carlo Method with 20,000 simulations (Selig & Preacher, 2009). Confidence intervals that do not include zero are shown in bold. Standard errors are presented in parentheses.

Table S2.14

Robustness Check: Direct Effects Path Analysis—Perceived Discrimination by Law Enforcement and Security (Item 4)

Variable	Physical activity (W2)	Nutrition (W2)	Sleep (W2)	Substance use (W2)	Well-being (W3)
Age	-.03*** (.02)	.02 [†] (.02)	-.01 (.02)	.04*** (.01)	.01 (.03)
Gender (ref. male)	-.10*** (.02)	-.01 (.02)	.06*** (.02)	-.04*** (.01)	-.08*** (.03)
Parents' occupational status (ISEI)	.04*** (.00)	.03** (.00)	.03** (.00)	.03** (.00)	-.03* (.00)
Subjective material deprivation	-.03** (.02)	-.01 (.01)	.00 (.02)	.00 (.01)	-.06*** (.03)
Migration status (ref. natives)	-.03** (.03)	-.05*** (.02)	-.08*** (.03)	-.05*** (.02)	.00 (.04)
Religious affiliation (ref. no/majority)	-.01 (.03)	.00 (.03)	.02 [†] (.03)	-.07*** (.02)	.02* (.05)
Physical activity (W1)	.51*** (.01)				
Nutrition (W1)		.59*** (.01)			
Sleep (W1)			.36*** (.01)		
Substance use (W1)				.64*** (.01)	
Well-being (W1)					.28*** (.01)
Perceived discrimination by law enforcement and security (W1)	.00 (.02)	-.03*** (.02)	-.02* (.02)	.03** (.01)	-.04*** (.05)
Physical activity (W2)					.05*** (.02)
Nutrition (W2)					.05*** (.02)
Sleep (W2)					.02* (.02)
Substance use (W2)					.00 (.02)

Note. $N = 9,957$ students. The table presents standardized path estimates, β , with standard errors in parentheses. In the specified model, covariances between health behaviors were included. Control variables included age, gender (reference group boys vs. girls), parents' occupational status (measured by the interval-scaled International Socio-Economic Index of occupational status [ISEI], range 0–90, with higher values indicating higher occupational status and thus higher socioeconomic status), subjective material deprivation (measured on a scale of 0–4, with higher values indicating higher material deprivation and thus lower socioeconomic status), migration status (reference group natives vs. adolescents with migration history), and religious affiliation (reference group no religion or affiliation with majority religion vs. minority religion affiliation). Coefficients with p values $< .05$ are highlighted in bold for emphasis. Ref. = reference group. W1, W2, and W3 = First, second, and third measurement wave, respectively.

[†] $p < .01$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table S2.15

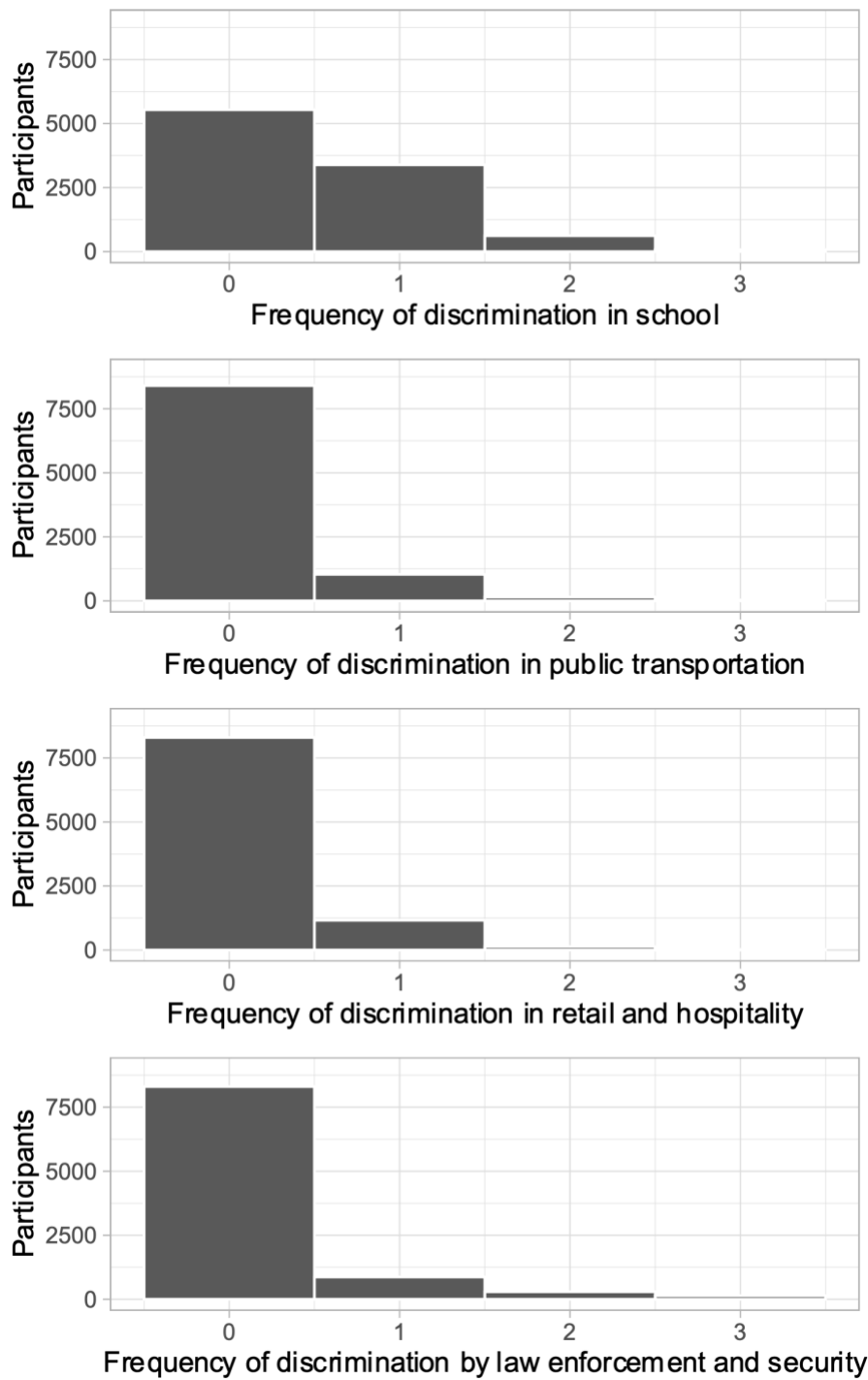
Robustness Check: Indirect Effects Path Analysis—Perceived Discrimination by Law Enforcement and Security (Item 4)

Path	β	95% CI
Perceived discrimination → Physical activity → Well-being	.000 (.001)	[-0.002, 0.003]
Perceived discrimination → Nutrition → Well-being	-.002 (.002)	[-0.009, -0.002]
Perceived discrimination → Sleep → Well-being	-.001 (.001)	[-0.004, -0.00003]
Perceived discrimination → Substance use → Well-being	.000 (.001)	[-0.002, 0.002]

Note. β = standardized path estimate; CI = confidence interval computed using the Monte-Carlo Method with 20,000 simulations (Selig & Preacher, 2009). Confidence intervals that do not include zero are shown in bold. Standard errors are presented in parentheses.

Figure S2.1

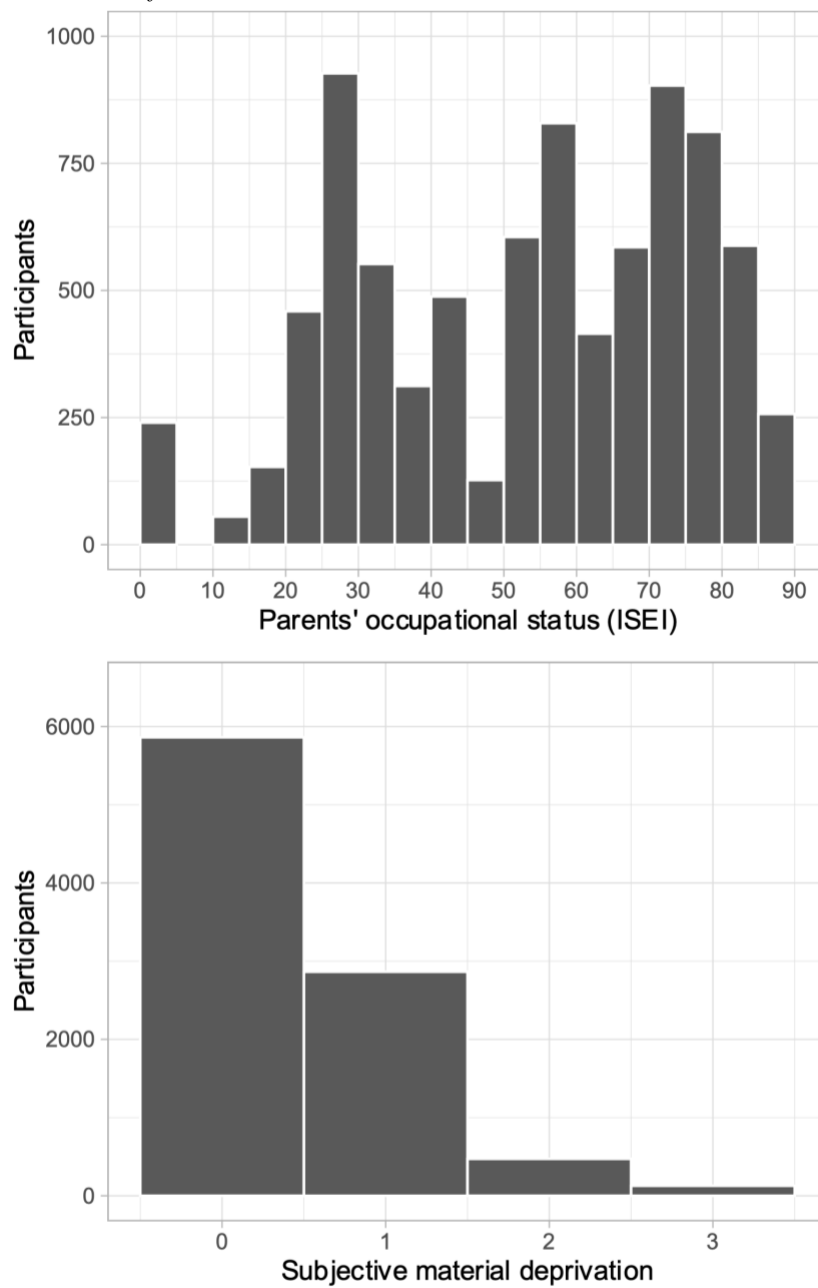
Distribution of Perceived Discrimination, Wave 1, Separate Items



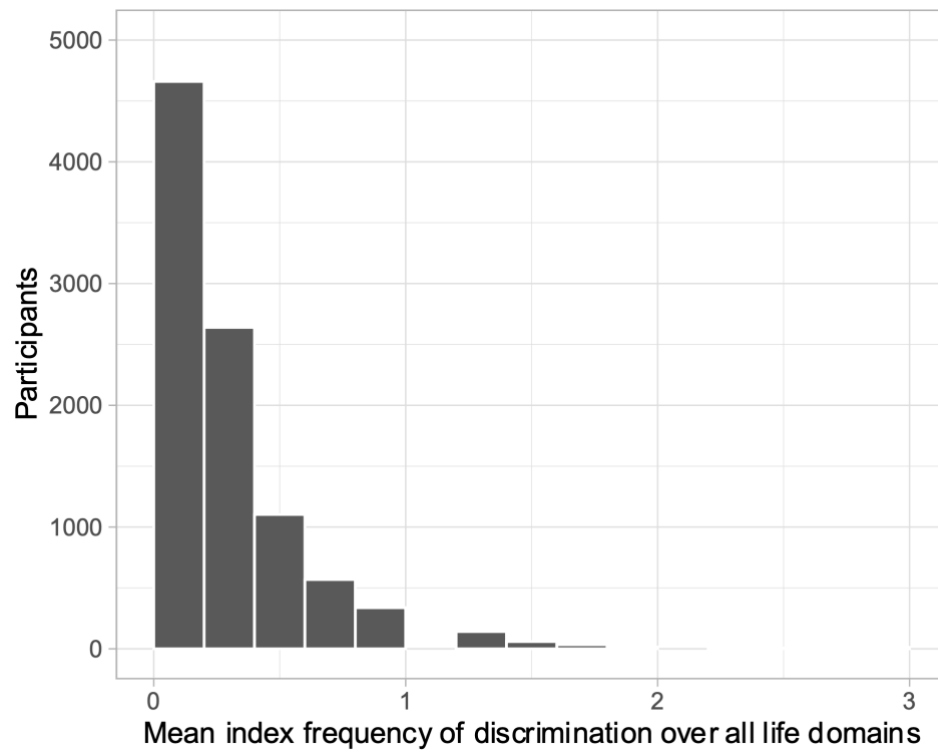
Note. Perceived discrimination was assessed with a 4-point scale of 0 (*never*) to 3 (*always*).

Figure S2.2

Distribution of Socioeconomic Status Variables



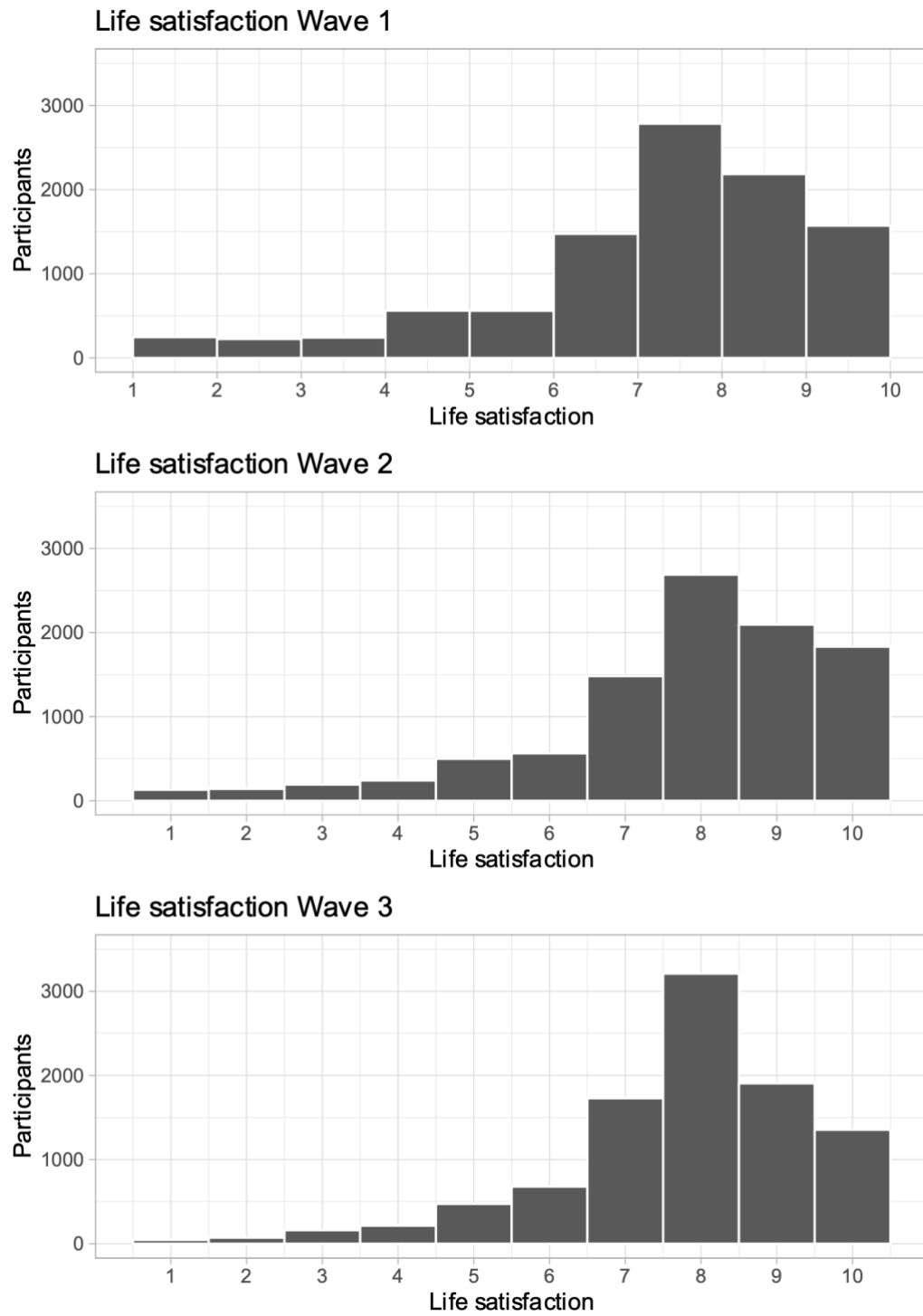
Note. Parents' occupational status was measured by the interval-scaled International Socio-Economic Index of occupational status (ISEI), range 0–90, with higher values indicating higher occupational status). Subjective material deprivation was measured on a scale of 0–4, with higher values indicating greater material deprivation.

Figure S2.3*Distribution of Perceived Discrimination, Wave 1*

Note. Mean index reflecting discrimination across four diverse life domains (school, public transportation, retail and hospitality, and law enforcement and security). Responses ranged from 0 (*never*) to 3 (*always*).

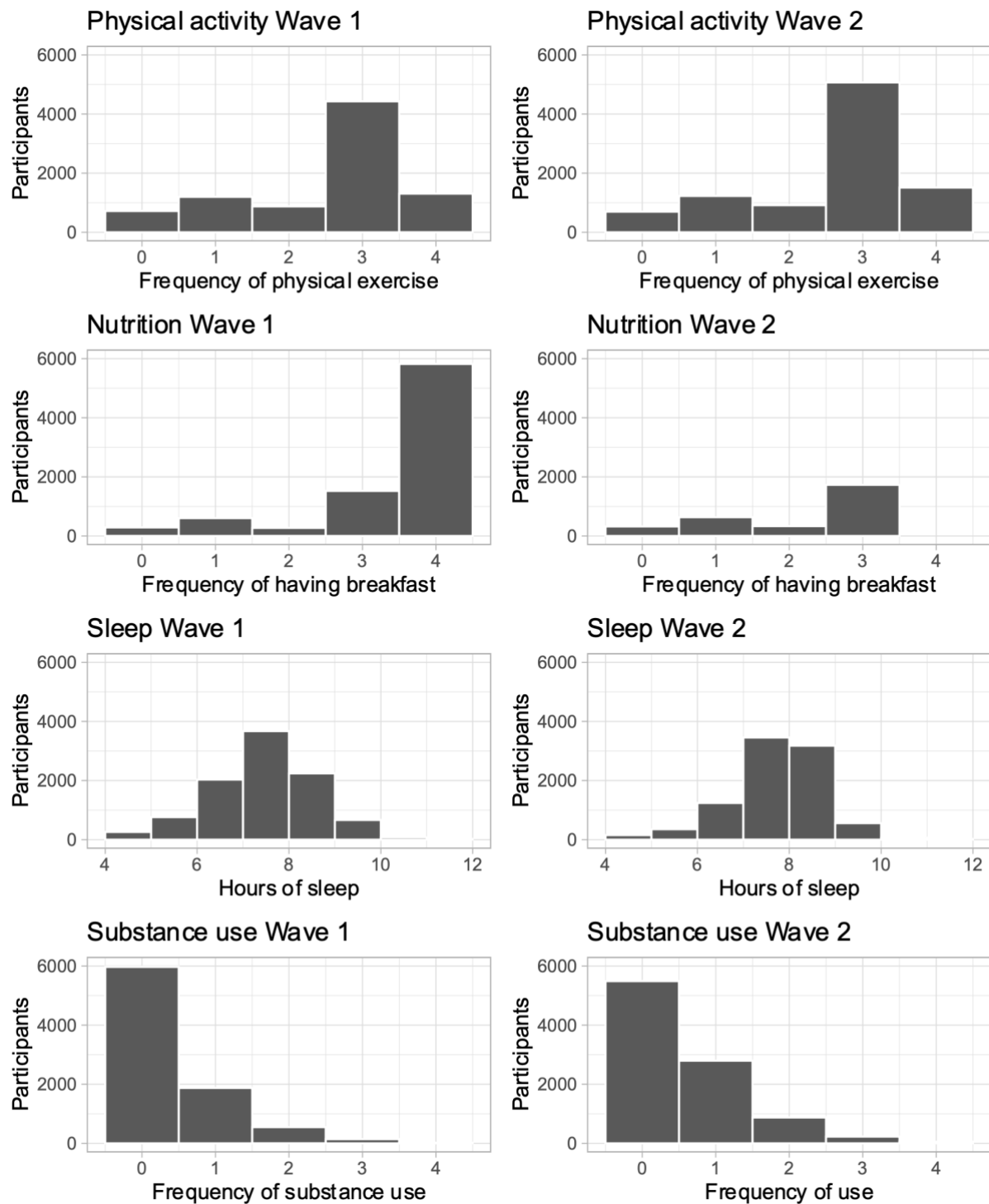
Figure S2.4

Distribution of Life Satisfaction



Note. Life satisfaction was assessed on a Likert scale of 1 (*very unsatisfied*) to 10 (*very satisfied*).

Figure S2.5
Distribution of Health Behaviors



Note. The frequency of physical activity, having breakfast, and substance use were assessed on a 5-point Likert scale of 0 (*never*) to 4 (*every day*). Sleep duration was assessed as hours of sleep with an open-ended question, winsorized at 12 hr.

Manuscript 3 – Well-being and cultural identity in migrant acculturative stress: A daily diary study

Manuscript submitted for publication:

Emmer, C., Mann, F., Edelinski, K., & Mata, J. (2024). *Well-being and cultural identity in migrant acculturative stress: A daily diary study* [Manuscript submitted for publication].

Aside from minor changes to the format, the manuscript included in this dissertation reflects the manuscript that was submitted for publication.

Abstract

Objective: The number of people migrating has risen continuously to about 280 million worldwide. Migration involves adapting to new cultural settings while retaining one's own culture, which can lead to acculturative stress, a risk factor for migrant health and identity.

Methods: We investigated the interplay between acculturative stress, well-being, cultural identity, and the protective role of physical activity using a 7-day-diary methodology with 266 participants with migration history (1,473 observations).

Results: Daily acculturative stress was associated with lower well-being (positive affect: $\beta = -.05, p = .011$; negative affect: $\beta = .05, p = .014$) and lower national ($\beta = -.07, p < .001$) but not ethnic ($p = .343$) identity. Physical activity was linked to higher well-being (positive affect: $\beta = .15, p < .001$, negative affect: $\beta = -.12, p < .001$) and showed a tendency to buffer negative affect associated with acculturative stress ($\beta = -.04, p = .066$). Being physically active was not associated with ethnic identity ($p = .196$) but in tendency with national identity ($\beta = .02, p = .072$). Supporting social identity theory, exploratory analyses indicated that stronger cultural identity correlated with higher well-being. Furthermore, cultural identity did not buffer the effects of acculturative stress on well-being but exacerbated them. All analyses were controlled for general stress.

Conclusions: The findings identify daily acculturative stress as an additional burden for people with migration history, highlighting the buffering potential of physical activity. Interventions might consider cultural identity and target physical activity to promote migrant health.

Introduction

Over the last decades, the number of people migrating between countries has risen continuously to about 280 million people worldwide in 2020 (McAuliffe & Triandafyllidou, 2021). Despite its relevance, psychological perspectives on migration are often clinical, neglect mechanisms, and are deficit oriented. We took a day-to-day perspective on migration by analyzing the intersection between acculturative stress, well-being, and cultural identity on a micro level and considered physical activity as a protective factor.

Migration, Acculturative Stress, and Well-Being

Although commonly perceived as a health hazard, migration does not necessarily lead to poorer health. People with migration experience often have lower mortality rates than the domestic-born population—a paradoxical finding given that migrant populations face stressors such as discrimination and socioeconomic disadvantages, which exacerbate adverse health outcomes (Nazroo, 2003). This so-called *healthy migration effect* mostly holds for physical health, but it has not been consistently found for mental health (Elshahat et al., 2022). Stressors occurring prior to and during migration have been linked to trauma-related psychiatric conditions, especially for people seeking refuge (Bustamante et al., 2018). Postmigration stressors, such as social, structural, and acculturative stressors, pose a risk for mental disorders as well (Li et al., 2016). Psychiatric conditions, such as affective disorders, are often less prevalent in the first migration generation but more prevalent in the second compared to nonmigratory populations (e.g., Salas-Wright et al., 2014). This is particularly interesting, considering that the second generation was not directly exposed to stressors prior to and during migration.

Postmigration stress also includes acculturative stress, which is inherent in the process of acculturation—adapting to the culture one lives in while retaining aspects of one’s culture of origin (Schwartz et al., 2021). It comprises stressors such as discrimination experiences, language barriers, or interpersonal conflicts due to cultural habits or cultural isolation (Miller et

al., 2011). Following acculturation theory, acculturative stressors can stem from the society one lives in and from one's ethnic group (Miller et al., 2011). For instance, a person in the second migration generation might experience language barriers when speaking with teachers at school and also with their parents at home.

Acculturative stressors have been linked to mental health outcomes, such as depression and anxiety symptoms (Keles et al., 2017). Evidence is especially strong for the effect of discrimination on mental health (Emmer et al., 2024). Acculturative stress and discrimination often come in the form of small daily events or microaggressions (e.g., Emmer et al. 2024), yet little is known about how these everyday migration-related stressors affect mental health.

Cultural Identity

Acculturative stressors influence both well-being and identity. The concept of identities as “social selves” (Thoits, 2013) describes self-categorizations internalized through social interactions. These categories may encompass sociodemographic characteristics (e.g., ethnicity) or social roles (e.g., occupation). In the context of migration, cultural identity—the sense of belonging to a particular culture—plays a crucial role, as it develops and changes in the acculturation process and can be impacted by acculturative stressors (Ward & Szabó, 2023). Following social identity theory (Tajfel & Turner, 1979), experiences of threat and rejection from a cultural group can negatively impact identification with that group. In contrast, positive social processes such as social support and acceptance can lead to stronger identification (Ward & Szabó, 2023). Since people with a migration history (i.e., themselves or with at least one parent born outside their country of residence or without its corresponding nationality) typically identify with more than one culture, we have focused on two forms of cultural identity: ethnic and national identity (cf. Schwartz et al., 2021). Ethnic identity refers to an individual’s sense of belonging to their own or their family’s culture of origin. National identity refers to a sense of belonging to one’s current country of residence and its culture—for the sample at hand,

Germany. Schwartz et al. (2021) were the first to observe ethnic and national identification on a daily level and found that cultural identity is less stable than expected: Cultural identities fluctuate from day to day. The self-verification theory (Swann, 1997) postulates that these identity fluctuations may be perceived as distressing because the need for a stable identity is stronger than the need for a positive identity. However, Thoits (2013) argued that it is particularly identity losses (i.e., negative deviations) that are perceived as stressful and not fluctuating identity per se.

Although acculturative stressors encompass more than discrimination and can also originate from one's ethnic group, current research has primarily focused on discrimination. The rejection identification model (Branscombe et al., 1999) suggests a process of national disidentification and a self-protective increase in ethnic identification in response to discrimination. In a longitudinal study by Fleischmann et al. (2019), participants with more frequent discrimination experiences showed lower national identification over time. The extent to which they disidentified, in turn, predicted higher ethnic identification. Importantly, the evidence is not yet conclusive: Some studies indicate that discrimination is related to weaker national but not ethnic identity, whereas others even show that discrimination weakens ethnic identity (review by Ward & Szabó, 2023). Nonetheless, the assumptions of the rejection identification model challenge the view that identity changes are inherently stressful, suggesting they can also serve as coping mechanisms.

So far, only Schwartz et al. (2021) have examined cultural identification and its relation to well-being on a micro level. They examined an aggregated measure of fluctuation, operationalized as standard deviations in cultural identities across 12 days, and found that stronger fluctuations in ethnic but not national identity predicted lower mental health outcomes. A within-person analysis examining daily levels of cultural identification can provide more thorough insights into the dynamics of acculturative stress, cultural identity, and well-being that

are obscured by aggregations and between-person comparisons. Moreover, within-person comparisons are critical given the rapidly changing nature of emotional states, minimize the influence of confounding interpersonal characteristics, and allow explorations of buffering or exacerbating adverse effects of cultural identification fluctuations on well-being.

Physical Activity as a Protective Factor

Considering that acculturative stress diminishes well-being and cultural identity, what potential mechanisms could mitigate these effects? One candidate mechanism is leisure-time physical activity, which has proven to be a protective factor for mental health (Mata et al., 2012; White et al., 2017) and to buffer adverse effects of stress on well-being (Flueckiger et al., 2016). The protective role of physical activity has been investigated mostly for general stress, not migration-specific stress. Previous findings indicate that acculturation may be beneficial to participation in physical activity, and conversely, physical activity may be a tool to facilitate acculturation and strengthen both cultural identities (Hatzigeorgiadis et al., 2013).

Hypotheses and Exploratory Research Questions

The objective of the present study was to assess how experiences of acculturative stress impact well-being and cultural identity on a daily level and to examine whether physical activity acts as a protective factor against acculturative stress (Figure 3.1).

Model 1. Acculturative Stress, Physical Activity, and Well-Being

H1.1. On days on which participants report more acculturative stress, they will report (a) more negative affect and (b) less positive affect.

H1.2. On days on which participants report more leisure-time physical activity, they will report (a) less negative affect and (b) more positive affect.

H1.3. The more leisure-time physical activity a participant reports, the weaker the link will be between (a) acculturative stress and negative affect and (b) acculturative stress and positive affect.

Model 2. Acculturative Stress, Physical Activity, and Cultural Identity

H2.1. On days on which participants report more acculturative stress, they will report (a) less ethnic identification and (b) less national identification.

H2.2. On days on which participants report more leisure-time physical activity, they will report (a) more ethnic identification and (b) more national identification.

H2.3. The more leisure-time physical activity a participant reports, the weaker the link between (a) acculturative stress and ethnic identification and (b) acculturative stress and national identification will be.

Exploratory Analysis. Cultural Identity and Well-Being

Exploratory Question 1. Does daily cultural identification predict well-being, and if so, do they correlate positively or negatively?

Exploratory Question 2. Does daily cultural identification moderate the relationship between acculturative stress and well-being, and if so, does it weaken or strengthen the effect?

Method

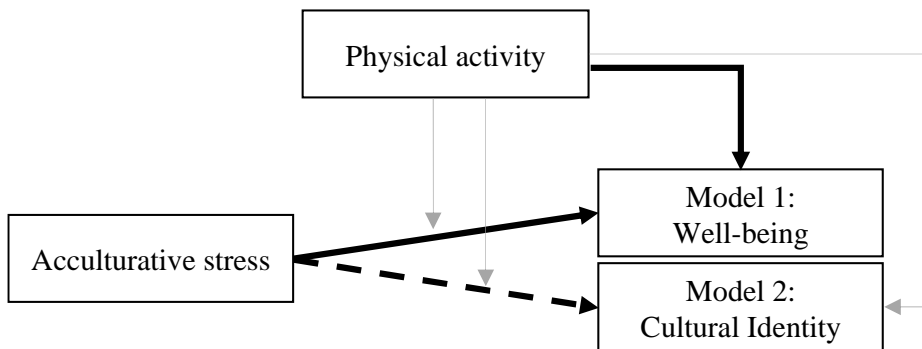
Transparency and Openness

The study was preregistered before data collection and analysis. All related materials are accessible at https://osf.io/8a6xp/?view_only=8053dbc60ab44744bc0e76eb7bb7f66e. We deviated from the preregistration in two respects: (1) For variation in cultural identity (H2), we now use daily directed deviations from the personal mean (i.e., group-mean centering; Enders & Tofighi, 2007) instead of daily fluctuations as preregistered. We do examine fluctuations on a weekly level in additional analyses. (2) Instead of using occupation as a control variable, we examine education because it is more reflective of socioeconomic status in migrant populations—particularly for forced migration—and is strongly associated with occupation.

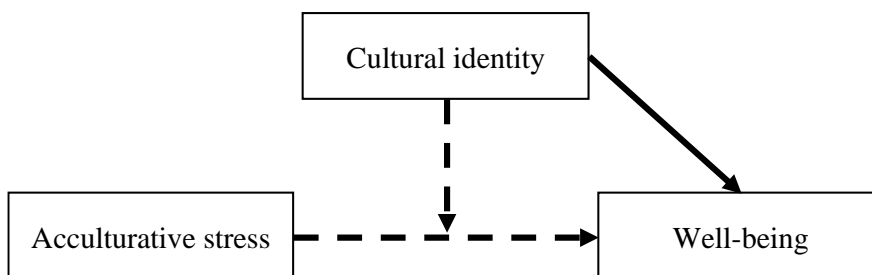
Figure 3.1

Overview of Main Hypotheses and Connecting Exploratory Analysis

A) Main Models 1 and 2



B) Exploratory Analysis 1



- ▶ Significant
- -▶ Only significant for some indicators of moderator/outcome
- ▶ Not significant or contradicting hypothesis

Note. The first row (A) represents the primary hypotheses, focusing on well-being (Model 1) and cultural identity (Model 2) as outcomes. The second row (B) visualizes the exploratory analysis, which connects the outcomes of Models 1 and 2 and explores the relationship between cultural identity and well-being.

Sample and Procedure

The Ethics Committee of the [committee name withheld for review] approved the study ([approval number withheld for review]). Individuals with a migration history, currently residing in Germany, aged 18 years or older, and without limitations in physical activity throughout the study period (e.g., injuries) were invited to participate. We recruited participants during July and August 2022 through contact with online communities and forums related to migration, relevant nongovernmental organizations, paid ads on social media (Meta), and snowballing techniques. After providing informed consent, participants completed a 15-min baseline survey on sociodemographic and control variables. Subsequently, participants were invited to download the

SEMA³ app (O'Brien et al., 2023) onto their smartphones, through which they could complete seven daily surveys over the course of a week; each survey took approximately 5 min.

Notifications were sent at 18:00 each day, and the survey remained open until midnight.

Participants were compensated with €10.

A total of 306 people with 1,621 observations participated. To prevent fraud and eliminate biases caused by travel or individuals currently not residing in Germany, we excluded

96 observations and 13 participants. Because of technical difficulties, one participant contributed more than seven daily surveys (i.e., nine daily responses); observations exceeding 7 days were removed. Consistent with our preregistration, method-based and multivariate outliers were excluded (a total one participant and 24 daily observations): Method-based outliers in response times were excluded if they exceeded mean ± 3 standard deviations ($n = 2$ daily observations from two participants). Excluding these outliers, the average response time for the daily questionnaire was 2.96 min ($SD = 2.57$). Multivariate outliers were excluded using Mahalanobis distance method (one participant and 22 observations). The pattern of results without outlier exclusion is comparable to the main analysis, with the exception that daily associations of physical activity with cultural identity become significant (Table S3.1). Of the remaining sample, 26 people were excluded because they participated in only one daily survey. In total, there were no systematic differences in sociodemographics between excluded participants ($N = 40$) and the final sample ($N = 266$; Table S3.2).

The final sample of 266 participants should suffice to uncover small effects in multilevel models (Arend & Schäfer, 2019). This sample provided 1,473 observations (average compliance: 79.1% or 5.54 days, range: 2–7 days). The average age was about 33 years, about 70% identified as female, and about 70% had a university degree (Table 3.1). Most reported personal migration experience and voluntary migration (Table S3.3 for details).

Table 3.1*Sociodemographic and Migration-Related Sample Characteristics by Language Group*

Characteristic	Turkish (<i>N</i> = 90, <i>n</i> = 499)	Russian (<i>N</i> = 94, <i>n</i> = 500)	German (<i>N</i> = 82, <i>n</i> = 474)	Overall (<i>N</i> = 266, <i>n</i> = 1,473)
Age (years), <i>M</i> (<i>SD</i>)	31.94 (6.15)	33.28 (9.10)	32.49 (10.48)	32.57 (8.69)
Gender, %				
Male	51.1%	9.6%	20.7%	27.1%
Female	47.8%	90.4%	76.8%	71.8%
Nonbinary	1.1%	0.0%	0.0%	0.4%
No gender specified	0.0%	0.0%	2.5%	0.7%
Subjective SES (1–10), <i>M</i> (<i>SD</i>)	5.87 (1.77)	6.51 (1.99)	5.16 (1.62)	5.88 (1.89)
Education, %				
High education	83.3%	77.7%	50.0%	71.1%
Medium education	8.9%	14.9%	45.1%	22.2%
Low education	1.1%	3.2%	3.7%	2.6%
Other and not specified	6.7%	4.2%	1.2%	4.1%
Migration generation ^a , %				
First generation	98.9%	100.0%	58.5%	86.8%
Second generation	1.1%	0.0%	39.0%	12.4%
Not specified	0.0%	0.0%	2.5%	0.8%
Years since migration (first generation only)	3.39 (3.34)	2.81 (4.53)	12.75 (11.52)	5.04 (7.34)
Migration reason ^b , %				
Forced migration	37.8%	39.4%	4.9%	28.2%
Voluntary migration	60.0%	56.4%	90.2%	68.0%
Other	2.2%	4.2%	4.9%	3.8%
General fitness (1–5), <i>M</i> (<i>SD</i>)	3.09 (0.63)	2.50 (0.70)	3.50 (0.67)	3.01 (0.78)
Competitive sports, % yes	0.0%	3.2%	8.5%	3.8%

Note. All variables assessed at baseline.

^a First migration generation refers to participants born outside of Germany (i.e., the survey country); second migration generation refers to participants born in Germany with at least one parent born abroad or without German citizenship.

^b Forced migration includes flight and displacement as main migration reasons; voluntary migration reasons include education or employment, family reunification, utilizing European Union free movement rights, and late repatriation (for detailed information, see Table S3).

N = number of participants; *n* = number of observations; SES = socioeconomic status.

Translation and Validation of Study Materials

To address language barriers, the study material was available in German, Turkish, and Russian—the three largest linguistic groups in Germany. If questionnaires were not available in a language, they were translated using the TRAPD method (Team translation, Review, Adjudication, Pretest, and Documentation), which minimizes inaccuracies and ensures cultural adaptation (Walde & Völlm, 2023). All questionnaires were validated using cognitive interviews to ensure cultural and linguistic accuracy (Berrigan et al., 2010).

Measures

The baseline assessment included sociodemographic and migration-related information; study variables were measured in the daily surveys. Between- and within-person reliability of daily measures were calculated with Revelle's ω for scales with three or more items. We additionally conducted multilevel confirmatory factor analysis for scales with four or more items. For two-item scales, we assessed internal consistency using Cronbach's α .

Sociodemographic and Migration-Related Information

Sociodemographic variables included age, gender, subjective socioeconomic status (MacArthur Scale; Galvan et al., 2023), and highest educational achievement. Educational achievement was classified according to the International Standard Classification of Education and aggregated into low, medium, and high education (cf. Eurostat Statistics Explained, 2018). Participants reported their own and their parents' birth countries. For participants who migrated themselves, the duration of residence in Germany was determined by the reported year of immigration. Participants also indicated the primary reason for their personal or parents' migration. General fitness (cardiorespiratory and muscular fitness, speed, flexibility; International Fitness Scale, Ortega et al., 2011) and participation in competitive sports (yes vs. no) were reported.

Well-Being

Daily well-being was assessed using the Pleasantness Scale (Röcke, 2006). On a 7-point Likert scale, participants indicated how much they had felt each of the following emotions on that day: happy, content, and cheerful for positive affect; sad, downhearted, and frustrated for negative affect. For positive affect, Revelle's ω_{within} was .86 and ω_{between} was .97; for negative affect, ω_{within} was .74 and ω_{between} was .86.

Cultural Identity

From a cultural identity scale (Leszczensky & Gräbs Santiago, 2014), the two items for national identity and the two items for ethnic identity with the highest factor loadings and capturing both the evaluative ("*I am glad to belong to the German culture/my culture of origin*") and the affective ("*I feel strongly attached to Germans people from my culture of origin*") dimensions of cultural identity were chosen. Responses were recorded on a 5-point Likert scale. The two respective items were aggregated using a mean score for the national and the ethnic identity. For ethnic identity, Cronbach's $\alpha_{\text{within}} = .62$ and $\alpha_{\text{between}} = .84$; for national identity, $\alpha_{\text{within}} = .59$ and $\alpha_{\text{between}} = .83$.

Stress

Participants rated the amount of *general stress* on a given day using one item on a 6-point Likert scale (Littman et al., 2006). *Acculturative stress* was assessed with the Riverside Acculturation Stress Inventory (Benet-Martínez & Haritatos, 2005) across five dimensions: work challenges, language skills, intercultural relations, discrimination, and cultural isolation. For feasibility in daily assessment, one item per dimension was selected on the basis of the highest factor loading (from Miller et al., 2011) and insights from cognitive interviews. Items were linguistically adapted to the German context on the basis of the cognitive interviews (see Tables S3.4 and S3.5 for item details). Revelle's $\omega_{\text{within}} = .61$ and $\omega_{\text{between}} = .88$. Construct validity and factor structure were examined with multilevel confirmatory factor analyses, suggesting a good fit to the data, $\chi^2(5, N = 1,473) = 60.26, p < .001$, comparative fit index = .957, root-mean-square area of approximation = .087, within-person standardized root-mean-square residual (SRMR) = .045, between-person SRMR = .004; all five items loaded on a single factor ($p < .001$).

Physical Activity

Physical activity was assessed with the Godin Leisure-Time Exercise Questionnaire (Godin, 2011), modified for daily online reporting (Mata et al., 2012). Participants reported the

duration of mild (minimal effort, e.g., easy walking), moderate (not exhausting, e.g., fast walking), and strenuous (heart beats rapidly, e.g., running) activities within the survey day. The daily minutes of each physical activity level were converted into MET (metabolic equivalent of task) minutes, which estimate energy expenditure by weighting the time spent being physically active by intensity. Higher scores reflect higher levels of physical activity.

Typical Day and Participation Day

Participants indicated whether they considered the participation day a typical day. If not, they could specify their reasons in an open text field. The survey smartphone application automatically captured the participation day.

Analytic Procedure

We used multilevel modeling to address the nonindependence of the nested data, which allowed us to examine within-person (Level 1) and between-person (Level 2) associations. All continuous Level 1 predictors were centered within individuals; positive values represent higher values than the individual's mean (i.e., group-mean centering). Level 2 predictor values were based on individual means and centered around the mean of all participants (i.e., grand-mean centering). Throughout the manuscript, we report standardized effects; simple slope analyses were conducted for interpretation of significant interaction effects. Given the novelty of our research question and the paradigm used, we considered it important to also report effects with a p -value less than .1. In cases where p -values were between $>.05$ and $<.1$, we describe the findings as "in tendency". This approach is intended to provide a more comprehensive picture of the results and to help stimulate further research in this area.

For hypothesis testing, we employed multilevel random-slope random-intercept regression models using the lmerTest package (Kuznetsova et al., 2017) in R (version 4.3.1). All multilevel regression models contained the maximum random effect structure supported by our data to enhance generalizability and control the Type I error rate (Barr et al., 2013). Because of

nonconvergence linked to negligible random effect variance, random slopes for physical activity (in Models 1 and 2) and ethnic identity (in our exploratory model) were excluded. Given the robustness of multilevel models to deviations from normal distribution of residuals and heteroscedasticity (Schielzeth et al., 2020), we did not modify primary data. We computed each model without and with control variables. Although we anticipated differences based on migration generation and reasons, these were not controlled because of confounding with language groups (Table S3.3 for details). As results were consistent across models, we report them including all control variables throughout the manuscript (Table S3.6 for results without control variables). Additional analyses differentiated general acculturative stress into the five life domains and examined aggregated weekly fluctuations of cultural identity.

Results

Preliminary Analysis

Intraclass correlation coefficients of variables ranged between .31 and .78, indicating that 22% to 69% of the variance in variables is within-person variance and using multilevel modeling techniques is appropriate (Table 3.2 for details).

Hypothesis Testing

Model 1. Acculturative Stress, Physical Activity, and Well-Being

Results are detailed in Table 3.3 (Model 1). Acculturative stress predicted well-being. More acculturative stress on a given day was associated with less positive ($\beta = -.05, p = .011$) and more negative ($\beta = .05, p = .014$) affect, supporting H1.1. Physical activity predicted well-being: Participants reported more positive ($\beta = .15, p < .001$) and less negative ($\beta = -.12, p < .001$) affect on days with more reported MET minutes, supporting H1.2. Physical activity did not moderate the effect of acculturative stress on positive affect ($p = .917$), but it tended to moderate the effect on negative affect ($\beta = -.04, p = .066$), not supporting H1.3. The simple slope analysis (Figure 3.2A) showed that acculturative stress was positively associated with

negative affect only for average ($\beta = .05, p < .05$) or low ($\beta = .09, p < .01$) levels of physical activity.

Model 2. Acculturative Stress, Physical Activity, and Cultural Identity

Results are detailed in Table 3.3 (Model 2). Acculturative stress did not predict ethnic identity ($p = .343$) but it did predict less national identity ($\beta = -.07, p < .001$), partially supporting H2.1. Physical activity did not predict ethnic identity ($p = .196$), but it did predict marginally more national identity ($\beta = .02, p = .072$), not supporting H2.2. Physical activity moderated the effect of acculturative stress on ethnic identity ($\beta = -.05, p = .002$) and national identity ($\beta = -.06, p < .001$), but in the opposite direction than hypothesized, not supporting H2.3. The simple slope analysis (Figure 3.2B) showed that acculturative stress was positively associated with ethnic identity only for low levels of physical activity ($\beta = .06, p < .01$) and negatively associated with national identity only for average ($\beta = -.07, p < .001$) or high ($\beta = -.14, p < .001$) levels of physical activity.

Exploratory Analysis: Cultural Identity and Well-Being

All exploratory results are detailed in Table 3.4. We found that cultural identity predicted well-being (Exploratory Question 1): Higher national and ethnic identity on a given day were both associated with more positive affect (ethnic identity: $\beta = .05, p = .007$; national identity: $\beta = .11, p < .001$) and less negative affect (ethnic identity: $\beta = -.05, p = .009$, national identity: $\beta = -.10, p < .001$).

Cultural identity moderated the effect of acculturative stress on well-being (Exploratory Question 2): National identity moderated the effect of acculturative stress on positive affect ($\beta = -.04, p = .008$) but not negative affect ($p = .286$). In contrast, ethnic identity moderated the effect of acculturative stress on negative affect ($\beta = .04, p = .008$) but not positive affect ($p = .144$). The simple slope analyses (Figure 3.2C) showed that acculturative stress was negatively associated with positive affect only when national identity was average ($\beta = -.04, p < .05$) or high ($\beta = -.08, p < .01$) and was positively associated with

negative affect only when ethnic identity was high ($\beta = .08, p < .01$). There was a marginal association when ethnic identity was average ($\beta = .04, p < .10$).

Additional Analyses

Acculturative Stress Across Life Domains

All results of the main analyses (Models 1 and 2) replicated for each of the five life domains of acculturative stress (Table S3.7 for details). The most consistent associations were found for *discrimination*, which was associated with less positive affect, more negative affect, and less national identification. *Intercultural relations* were associated with less positive but not negative affect, and more ethnic but not national identification. *Work challenges* were associated with less national identification but not ethnic identification, and a non-significant trend with more negative affect but not positive affect. *Cultural isolation and language barriers* were not associated with well-being or cultural identity.

Cultural Identity Fluctuations

Replicating H2 on an aggregate level, acculturative stress and physical activity were not associated with cultural identity fluctuations (operationalized as standard deviations over the study week). Also, no interaction of acculturative stress and physical activity emerged (Table S3.8). Replicating Exploratory Question 1 on an aggregate level, acculturative stress was associated with higher positive and lower negative affect over the survey week. Also, ethnic identity fluctuations were associated with lower positive and higher negative affect. National identity fluctuations were not associated with well-being. No interactions were found for acculturative stress and cultural identity fluctuations (Table S3.9).

Table 3.2*Intercorrelations Between Daily Assessed Variables*

Variable	<i>M</i>	<i>SD_b</i>	<i>SD_w</i>	ICC	1	2	3	4	5	6	7
1. Acculturative stress (1–5)	2.57	0.78	0.42	.78	—	-.06	-.24***	.48***	-.17**	-.27***	.22**
2. Physical activity (MET minutes)	368.50	267.01	323.09	.41	-.02	—	.08	-.03	.05	.01 [†]	.10
3. Positive affect (1–7)	4.43	0.98	1.06	.46	-.11***	.27***	—	-.53***	.23**	.38***	-.46***
4. Negative affect (1–7)	2.38	0.74	0.95	.38	.12***	-.20***	-.64***	—	-.18*	-.28***	.55***
5. Ethnic identity (1–5)	3.40	0.85	0.45	.78	.04	.05 [†]	.19***	-.18***	—	.13*	-.21**
6. National identity (1–5)	3.13	0.75	0.44	.75	-.14***	.06 [†]	.25***	-.23***	.23***	—	-.21**
7. General stress (1–6)	2.70	0.74	1.09	.31	.11***	-.07*	-.49***	.50***	-.14***	-.15***	—

Note. Correlations with 95% confidence intervals. Descriptives marked with b are on the between-person level, and those marked with w are on the within-person level. ICC = Intraclass correlation coefficient (percentage of variance between persons). Intercorrelations above the diagonal refer to the within-person level ($n = 1,473$), below the diagonal to the between-person level ($N = 266$). MET = metabolic equivalent of task.

[†] $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3.3
Results of the Multilevel Regression Analyses for Models 1 and 2

Predictors	Model 1: Well-being		Model 2: Cultural identity	
	Positive affect	Negative affect	Ethnic identity	National identity
(Intercept)	-.11	-.08	.20	.04
Within-person level				
Acculturative stress	-.05*	.05*	.02	-.07***
Physical activity	.15***	-.12***	.02	.02 [†]
Acculturative Stress × Physical Activity	-.00	-.04 [†]	-.05**	-.06***
Participation day	-.02	-.01	-.03*	.02
Typicality of day	.06	.06	-.04	-.03
General stress	-.31***	.33***	-.06***	-.05***
Between-person level				
Acculturative stress	-.10*	.17***	.04	-.13*
Physical activity	.11**	-.06 [†]	.03	-.00
Acculturative Stress × Physical Activity	-.05	.00	-.15**	-.08
General stress	-.33***	.33***	-.15**	-.11*
Age	.01	-.11**	.02	.10 [†]
Gender (ref. female and nonbinary)	.07	-.02	-.21	.33**
Education (ref. high)				
Medium education	.03	-.12	.05	.13
Low education	-.20	.29	.42	-.34
Subjective SES	-.16**	.06	-.09	-.03
General fitness	.08	-.01	.09	.13 [†]
Competitive sports (ref. no)	-.20	.11	-.35	.33
Language group (ref. German)				
Turkish	.13	.16	-.53**	-.38*
Russian	.12	.04	.04	-.07
Random effects				
Residual variance	.35	.42	.19	.22
Intercept variance	.30	.18	.63	.62
Random effect variance (acculturative stress)	.02	.02	.01	.02
ICC	.48	.31	.78	.74
<i>N</i>	250	250	254	250
Observations	1,379	1,379	1,382	1,379
Marginal R^2 / Conditional R^2	.311 / .640	.363 / .567	.147 / .809	.150 / .782

Note. The presented values are standardized regression coefficients β . All continuous within-person variables are person-mean centered; between-person variables are grand-mean centered. See Table S6 for hierarchical inclusion of control variables. Coefficients with p values $< .05$ are highlighted in bold. N = number of participants. ICC = Intraclass correlation coefficient; SES = socioeconomic status.

[†] $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

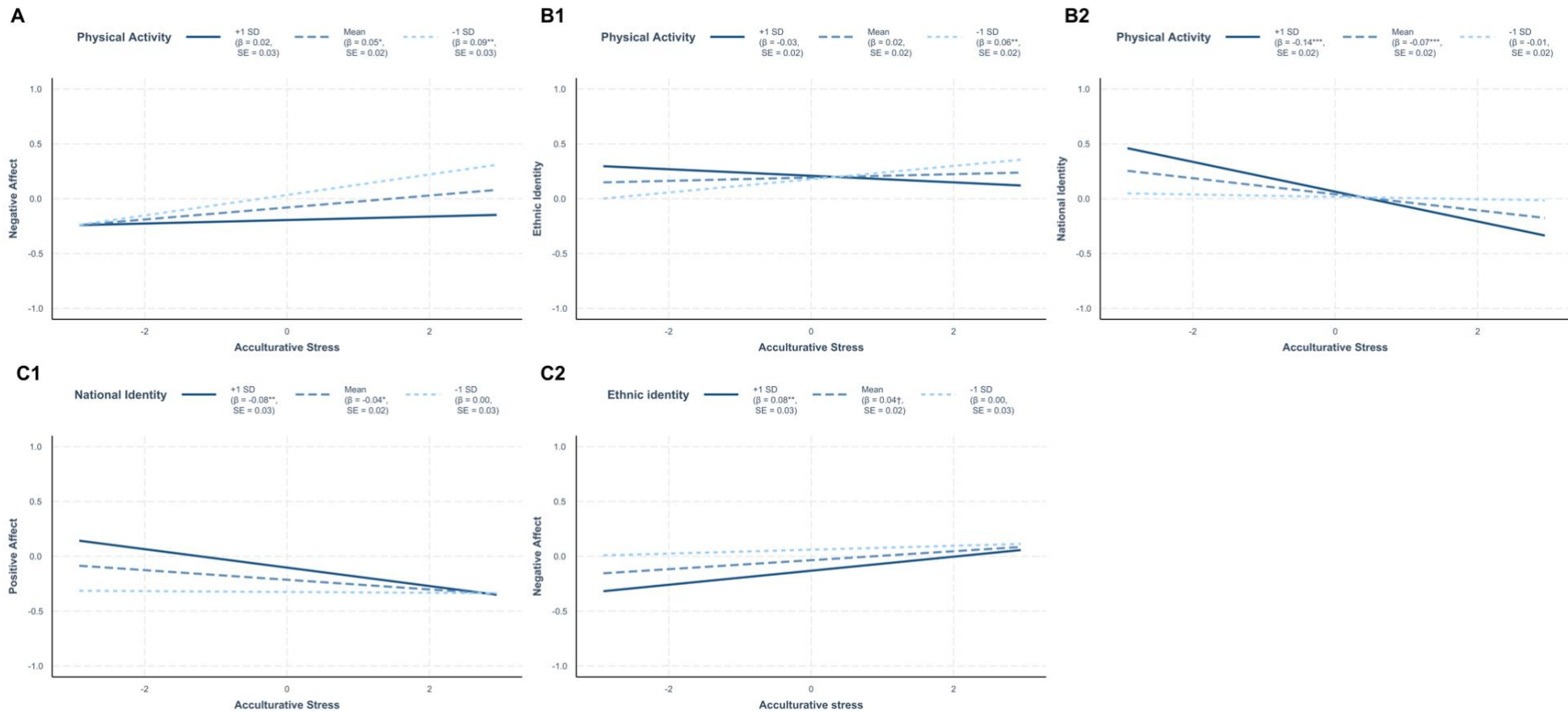
Table 3.4*Results of the Multilevel Regression Analyses for the Exploratory Analysis*

Predictors	Exploratory model: Well-being	
	Positive affect	Negative affect
(Intercept)	-.21*	-.03
Within-person level		
Acculturative stress	-.04*	.04 [†]
Ethnic identity	.05**	-.05**
National identity	.11***	-.10***
Acculturative Stress × Ethnic Identity	-.02	.04**
Acculturative Stress × National Identity	-.04**	.02
Participation day	-.03 [†]	-.00
Typicality of day	.12**	.02
General stress	-.30***	.31***
Between-person level		
Acculturative stress	-.07	.16***
Ethnic identity	.10*	-.01
National identity	.17***	-.04
Acculturative Stress × Ethnic Identity	-.05	-.02
Acculturative Stress × National Identity	-.04	.02
General stress	-.29***	.31***
Age	.00	-.12***
Gender (ref. female and nonbinary)	.06	.01
Education (ref. high)		
Medium education	.06	-.13
Low education	-.23	.33 [†]
Subjective SES	-.13**	.05
General fitness	.05	-.01
Competitive sports (ref. no)	-.15	.07
Language group (ref. German)		
Turkish	.24 [†]	.12
Russian	.18	-.01
Random effects		
Residual variance	.33	.38
Intercept variance	.27	.19
Random effect variance (acculturative stress)	.01	.03
Random effect variance (national identity)	.02	.03
ICC	.48	.38
<i>N</i>	250	250
Observations	1,379	1,379
Marginal R^2 / Conditional R^2	.346 / .658	.357 / .602

Note. The presented values are standardized regression coefficients β . All continuous within-person variables are person-mean centered; between-person variables are grand-mean centered. Coefficients with p values < .05 are highlighted in bold. N = number of participants. ICC = Intraclass correlation coefficient; SES = socioeconomic status.

[†] p < .10. * p < .05. ** p < .01. *** p < .001.

Figure 3.2
Results of the Simple Slope Analyses



Note. Top row: Significant interactions from Models 1 and 2. (A) The relationship between acculturative stress and negative affect moderated by physical activity. (B1) The relationship between acculturative stress and ethnic identity moderated by physical activity. (B2) The relationship between acculturative stress and national identity moderated by physical activity. Bottom row: Significant interactions from the exploratory analysis. (C1) The relationship between acculturative stress and positive affect moderated by national identity. (C2) The relationship between acculturative stress and negative affect moderated by ethnic identity. Correlation results are based on standardized data. All predictors presented are on the within-person level and are person-mean centered. For simple slope analyses of between-person interactions, see Figure S1.

$^\dagger p < .10$. $* p < .05$. $** p < .01$. $*** p < .001$.

Discussion

This 1-week diary study provides a micro-level perspective on the daily dynamics between acculturative stress, well-being, and cultural (i.e., national and ethnic) identity. The daily acculturative stressors that individuals with a migration background experience were associated with lower well-being and lower national but not ethnic identity. Physical activity emerged as a protective factor for well-being amid acculturative stress and even showed a trend toward buffering its adverse impact on negative but not positive affect. Being physically active was not related to cultural identity but in tendency to stronger national identity. Exploratory analyses showed that daily increases in ethnic and national identity were associated with higher well-being. Cultural identity did not buffer the effects of acculturative stress on well-being but exacerbated them.

Acculturative Stress, Well-Being, and Cultural Identity

More acculturative stress on a given day was associated with lower well-being, that is, less positive and more negative affect, supporting H1.1. This aligns with prior research on the negative effects of discrimination—one central form of acculturative stress—on well-being (e.g., Emmer et al., 2024; Keles et al., 2017). The larger between-person effects of acculturative stress on well-being suggest that the small daily effects accumulate over time. Acculturative stress predicted lower national identity on a given day, supporting H2.1b. Again, the effects of acculturative stress were more pronounced at the between-person level, suggesting potential accumulation of daily effects. This aligns with social identity theory (Tajfel & Turner, 1979), which postulates that feelings of rejection can lead to disidentification with the rejecting group. However, acculturative stress did not predict ethnic identity, contradicting H2.1a. Especially for recent immigrants—the majority of our sample—stressors linked to national identity may be the most salient, whereas stressors related to ethnic identity might be more relevant for later migration generations (Miller et al., 2011). This explanation aligns with our additional findings on discrimination (one of the five stress

domains examined), which showed the most consistent negative associations with well-being and national identity. These findings support the rejection-identification model's proposition of national disidentification in response to discrimination but contradict its assumption of a self-protective increase in ethnic identification (Branscombe et al., 1999).

Physical Activity as a Protective Factor

Daily physical activity predicted higher levels of well-being on a given day amid acculturative stress, supporting H1.2. This finding extends previous research on general stress to acculturative stress. These protective effects were primarily found at the within-person level, highlighting the acute benefits of physical activity. Contrary to our hypothesis, physical activity did not buffer the effects of acculturative stress on well-being (H1.3), except for a trend toward buffering negative affect (H1.3b). Despite a sufficiently large sample (cf. Arend & Schäfer, 2019), the power may not have been adequate to detect interaction effects. Differences in how physical activity impacts positive and negative affect could be attributable to their distinct functions: Negative affect is considered to reflect distress, positive affect to reflect pleasure (Röcke, 2006). Thus, physical activity might reduce distress but not the negative impact of acculturative stress on positive outcomes.

Physical activity was not associated with cultural identity, contrary to H2.2, except for a trend toward a positive relation with national identity (H2.2b). The protective role of physical activity for cultural identity may depend on qualitative dimensions, such as type and context, rather than the quantitative dimensions assessed in this study. Research on the cultural-identity-enhancing effects of physical activity has focused on social aspects, such as team composition, sense of belonging, and team environment (Hatzigeorgiadis et al., 2013). Our sole focus on quantitative aspects of physical activity in this study might also explain the unexpected direction of the interaction between physical activity and acculturative stress (H2.3): Physical activity did not buffer the adverse association of acculturative stress with

cultural identity but exacerbated it. Unpleasant or compulsory physical activities might hinder adaptive coping with identity-threatening stressors (White et al., 2017).

Cultural Identity as a Protective Factor and Cultural Identity Fluctuations

Higher ethnic and national identity on a given day were associated with higher well-being (Exploratory Question 1). Thus, identity fluctuations do not appear to be distressing or protective per se—rather, positive deviations from one’s average (i.e., stronger identification) seem to promote well-being. This challenges Swann’s (1997) self-verification theory, which assumes identity stability to be a more essential psychological need than positive self-evaluations but supports the view of social identity as a resource by providing meaning, purpose, and social support (Tajfel & Turner, 1979)—all beneficial to well-being (Cruwys et al., 2014).

Unlike national identity fluctuations, which showed no significant association with well-being, ethnic identity fluctuations were linked to lower average well-being. This aligns with the findings of Schwartz et al. (2021), which also showed that fluctuations in ethnic but not national identity predict negative mental health outcomes. Given that our sample predominantly consisted of recent immigrants, ethnic identity might be more established and integrated into individuals' self-concept, whereas national identity is likely still in formation, making changes in national identity less impactful on well-being. Fluctuating cultural identity may not be a mental health risk per se but rather a reflection of adapting to a new, sometimes even hostile, and stressful environment.

Cultural identity exacerbated the adverse association between acculturative stress and well-being (Exploratory Question 2). Higher group identification might be a vulnerability factor that amplifies the negative consequences of acculturative stressors, as the targeted identity is central to one’s self-perception (Tajfel & Turner, 1979). These findings could also reflect cultural disidentification in response to identity-threatening acculturative stressors (e.g., Branscombe et al., 1999), which can reduce immediate psychological distress.

Strength, Limitations, and Future Research

This study is the first to examine the daily interplay of post-migration stress, cultural identity, and well-being, providing insights into how minority stressors affect migrant populations and potential buffers against adverse effects. Multilingual data collection overcame language barriers, yielding a sample of participants with mostly recent migration experience and various cultural backgrounds and migration reasons—a population often overlooked in psychological research. Although this study could not systematically examine subgroup differences such as migration generation or reasons, the within-person perspective can mitigate this limitation. Still, future research should further explore these differences.

For many individuals with a migration history, acculturative stress is an everyday experience, but it has rarely been examined on a daily level. This study generates new insights about determinants of daily shifts in identity and their impact on well-being. Because the study took place in a natural setting with minimal intrusion (short surveys on participants' own smartphones), the findings have high ecological validity. Yet, due to its observational nature, the directionality of effects remains unclear.

Conclusion

Daily acculturative stress is related to lower well-being and national disidentification, above and beyond general daily stress. The findings suggest that daily effects may accumulate over time. The complex (daily) dynamics of cultural identity and its determinants and outcomes have been overlooked in current acculturation theories and should be further examined. Two potential protective factors were identified—daily physical activity and strong cultural identities. Tailored physical activity interventions could address both resilience factors simultaneously.

Ethics approval and consent to participate

Ethics approval was obtained before recruiting participants (Ethics Committee of the University of Mannheim, EK Mannheim 09-A/2021).

Availability of data and materials

The study preregistration, data, and analysis script are available on the Open Science Framework: <https://osf.io/8a6xp/>.

Disclosure of Interest

The authors have no conflicts of interest to disclose.

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CRedit author statement

Christine Emmer played a lead role in conceptualization, methodology, validation, formal analysis, investigation, data curation, writing: original draft, writing: review and editing, visualization, supervision, and project administration. Frauke Mann played a supporting role in conceptualization, formal analysis, data curation, writing: original draft, writing: review and editing. Ksenija Edelinski played a supporting role in conceptualization and investigation. Jutta Mata) played a lead role in conceptualization, supervision, funding acquisition, and writing: review and editing.

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Supplemental Material

Table S3.1

Sensitivity Analysis: Results of the Multilevel Regression Analyses Without Outlier Exclusion

Predictors	Model 1: Well-being		Model 2: Cultural identity	
	Positive affect	Negative affect	Ethnic identity	National identity
(Intercept)	-.17	-.10	.10	-.40
Within-person level				
Acculturative stress	-.06**	.05*	.02	-.07***
Physical activity	.13***	-.09***	.03*	.03*
Acculturative Stress × Physical Activity	-.03	-.02	-.04*	-.07***
Participation day	-.02	-.01	-.03*	.01
Typicality of day	.08 [†]	.06	-.03	-.01
General stress	-.32***	.34***	-.05***	-.05***
Between-person level				
Acculturative stress	-.10*	.17***	.06	-.14*
Physical activity	.09*	-.01	.06	.03
Acculturative Stress × Physical Activity	-.01	.02	-.15*	-.10 [†]
General stress	-.33***	.35***	-.15**	-.12*
Age	.01	-.11***	-.02	.09 [†]
Gender (ref. female and nonbinary)	.04	.04	-.21 [†]	.31*
Education (ref. high)				
Medium education	.01	-.10	.06	.16
Low education	-.22	.29	.42	-.29
Subjective SES	-.16***	.06 [†]	-.09 [†]	-.06
General fitness	.10*	-.03	.07	.13*
Competitive sports (ref. no)	-.02	-.04	-.16	-.35
Language group (ref. German)				
Turkish	.17	.10	-.58***	-.26
Russian	.15	.02	-.08	.05
Random effects				
Residual variance	.36	.42	.19	.21
Intercept variance	.31	.17	.65	.61
Random effect variance (acculturative stress)	.01	.02	.01	.02
ICC	.47	.31	.78	.74
<i>N</i>	287	287	287	287
Observations	1,511	1,511	1,511	1,511
Marginal R^2 / Conditional R^2	.296 / .627	.366 / .564	.133 / .807	.145 / .782

Note. The presented values are standardized regression coefficients β . All continuous within-person variables are person-mean centered; between-person variables are grand-mean centered. Coefficients with p values $< .05$ are highlighted in bold. N = number of participants. ICC = Intraclass correlation coefficient; SES = socioeconomic status.

[†] $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table S3.2
Comparison of Excluded vs. Included Participants

Predictors	Included participants (<i>N</i> = 266)	Excluded participants (<i>N</i> = 40)	Statistical test result ^a
Age (years), <i>M</i> (<i>SD</i>)	32.47 (8.69)	32.78 (7.50)	$t(56.26) = -0.16, p = .877$
Gender, % male (vs. female and nonbinary)	27.3%	31.4%	$\chi^2(1, N = 302) = 0.13, p = .719$
Subjective SES (1–10), <i>M</i> (<i>SD</i>)	5.88 (1.88)	5.48 (1.68)	$t(1.39) = 1.39, p = .172$
Education			$\chi^2(2, N = 294) = 2.48, p = .289$
High education, %	74.1%	84.6%	
Medium education, %	23.1%	15.4%	
General fitness (1–5), <i>M</i> (<i>SD</i>)	3.01 (0.78)	3.11 (0.81)	$t(50.72) = -0.76, p = .448$
Competitive sports, % yes	3.8%	5.0%	$\chi^2(1, N = 306) = 0.00, p = .100$
Migration generation ^b , % first generation)	87.5%	82.5%	$\chi^2(1, N = 304) = 0.42, p = .516$
Migration reason ^c , % voluntary migration	70.7%	86.1%	$\chi^2(1, N = 292) = 3.03, p = .082^\dagger$

Note. A total of *N* = 40 participants (*n* = 148) were excluded because they were in a time zone other than local or the survey country (*n* = 96), due to technical difficulties (*n* = 2), their daily assessments were identified as method-based outliers in response time (*n* = 2) or multivariate outliers based on the Mahalanobis distance (*n* = 22), or they participated in only one daily survey (*n* = 26).

^a Welch two-sample *t* tests were used for continuous variables, and Pearson's χ^2 tests with Yates's continuity correction for categorical variables.

^b First migration generation refers to participants born outside of Germany (i.e., the survey country); second migration generation refers to participants born in Germany with at least one parent born abroad or without German citizenship.

^c Forced migration includes flight and displacement as main migration reasons.

N = number of participants. SES = socioeconomic status.

[†] $p < .10$

Table S3.3
Absolute Frequencies of Migration Reasons by Language Group

Migration reason	Turkish (<i>N</i> = 90)	Russian (<i>N</i> = 94)	German (<i>N</i> = 82)	Overall (<i>N</i> = 266)
Forced migration (flight, asylum)	34	37	4	75
Voluntary migration				
Education	24	11	14	49
Family reunification	8	14	17	39
Family formation	4	4	13	21
Employment found prior to migration	8	9	11	28
Employment prospects	2	3	6	11
European Union free movement	7	6	1	14
Late repatriation	1	6	12	19
Other	2	2	1	5
Do not know/wish not to say	0	2	3	5

Note. *N* = number of participants.

Table S3.4*Overview of Acculturative Stress Items*

Stress domain	Item
Work challenges	“I felt that because of my migration history, I had to work harder than most Germans.”
Language	“I felt misunderstood or limited because of my language proficiency.”
Intercultural relations	“I felt that my cultural habits (German or from my culture of origin) cause conflicts in my relationships.”
Discrimination	“I felt that I was treated rudely or unfairly because of my migration history.”
Cultural isolation	“I felt that there are not enough people of my own ethnic/cultural group in my living environment.”

Note. The items presented here are translated into English for illustrative purposes. For the study, the items have been validated in German, Turkish, and Russian. In the daily questionnaire, participants were prompted with “How much do the following statements apply to today?” and responses were recorded on a Likert scale of 1 (*strongly disagree*) to 5 (*strongly agree*).

Table S3.5*Descriptives of Daily Assessed Separate Acculturative Stress Life Domain Variables*

Variable	<i>M</i>	<i>SD_b</i>	<i>SD_w</i>	ICC	1	2	3	4	5
1. Work challenges (1–5)	2.97	1.12	0.67	.74	—	.81***	.66***	.72***	.15*
2. Language barriers (1–5)	2.89	1.07	0.74	.67	.38***	—	.69***	.71***	.30***
3. Intercultural relations (1–5)	2.28	0.80	0.67	.59	.18***	.24***	—	.77***	.42***
4. Discrimination (1–5)	2.24	0.94	0.65	.68	.24***	.30***	.34***	—	.29***
5. Cultural isolation (1–5)	2.44	0.96	0.64	.69	.11***	.12***	.22***	.14***	—

Note. Correlations with 95% confidence intervals. Descriptives marked with b are on the between-person level, and those marked with w are on the within-person level. ICC = Intraclass correlation coefficient (percentage of variance between persons). Intercorrelations above the diagonal refer to the within-person level ($n = 1,473$), below the diagonal to the between-person level ($N = 266$).

* $p < .05$. *** $p < .001$.

Table S3.6

Results of the Multilevel Regression Analyses for Models 1 and 2 With Hierarchical Inclusion of Control Variables

Predictors	Model 1: Well-being								Model 2: Cultural identity							
	Positive affect				Negative affect				Ethnic identity				National identity			
(Intercept)	-.00	.00	-.03	-.11	.02	-.03	.00	-.08	.03	.03	.03	.20	-.02	-.00	-.01	.04
Within-person level																
Acculturative stress	-.08***	-.08***	-.04*	-.05*	.09***	.08**	.04 [†]	.05*	.01	.01	.02	.02	-.07***	-.07***	-.06***	-.07***
Physical activity	.18***	.18***	.15***	.15***	-.14***	-.15***	-.12***	-.12***	.02	.02	.01	.02	.02 [†]	.02 [†]	.02	.02 [†]
Acculturative Stress × Physical Activity	-.00	-.00	-.00	-.00	-.03	-.03	-.04 [†]	-.04 [†]	-.03*	-.03*	-.03*	-.05**	-.04**	-.04**	-.04*	-.06***
Participation day		.00	-.02	-.02		-.03	-.01	-.01		-.02 [†]	-.03*	-.03*		.02	.01	.02
Typicality of day (ref. no)		-.02	.07 [†]	.06		.14**	.04	.06		-.04	-.03	-.04		-.04	-.02	-.03
General stress			-.32***	-.31***			.35***	.33***				-.06***	-.06***		-.06***	-.05***
Between-person level																
Acculturative stress				-.10*				.17***				.04				-.13*
Physical Activity				.11**				-.06 [†]				.03				-.00
Acculturative Stress × Physical Activity				-.05				.00				-.15**				-.08
General stress				-.33***				.33***				-.15**				-.11*
Age				.01				-.11**				.02				.10 [†]
Gender (ref. female and nonbinary)				.07				-.02				-.21				.33**
Education (ref. high)																
Medium education				.03				-.12				.05				.13
Low education				-.20				.29				.42				-.34
Subjective SES				-.16**				.06				-.09				-.03
General fitness				.08				-.01				.09				.13 [†]
Competitive sports (ref. no)				-.20				.11				-.35				.33
Language group (ref. German)																
Turkish				.13				.16				-.53**				-.38*
Russian				.12				.04				.04				-.07
Random effects																
Residual variance	.47	.48	.36	.35	.57	.56	.43	.42	.20	.20	.19	.19	.23	.23	.22	.22
Intercept variance	.47	.47	.49	.30	.39	.39	.41	.18	.77	.77	.77	.63	.75	.75	.75	.62
Random effect variance (acculturative stress)	.02	.02	.01	.02	.02	.02	.02	.02	.01	.01	.01	.01	.02	.02	.02	.02
ICC	.51	.50	.58	.48	.42	.42	.50	.31	.80	.80	.80	.78	.77	.77	.77	.74
N	266	266	266	250	266	266	266	250	266	266	266	254	266	266	266	250
Observations	1,473	1,467	1,467	1,379	1,473	1,467	1,467	1,379	1,473	1,467	1,467	1,382	1,473	1,467	1,467	1,379
Marginal R ² /Conditional R ²	.039	.039	.135	.311	.029	.035	.148	.363	.001	.002	.006	.147	.008	.009	.011	.150
	/.525	/.523	/.637	/.640	/.434	/.440	/.577	/.567	/.800	/.801	/.804	/.809	/.774	/.773	/.776	/.782

Note. The inclusion of control variables was structured hierarchically: First, the day of the week and the typicality of the day were considered. Second, general daily stress was added to the model. Third, all Level 2 (between-person) predictor variables were integrated. The presented values are standardized regression coefficients β. All continuous within-person variables are person-mean centered, and between-person variables are grand-mean centered. Coefficients with *p* values < .05 are highlighted in bold. *N* = number of participants. ICC = Intraclass correlation coefficient; SES = socioeconomic status.

[†]*p* < .10. **p* < .05. ***p* < .01. ****p* < .001.

Table S3.7

Additional Analyses: Results of the Multilevel Regression Analyses with Separate Acculturative Stress Life Domains as Predictors

Predictors	Model 1: Well-being		Model 2: Cultural identity	
	Positive affect	Negative affect	Ethnic identity	National identity
(Intercept)	-.09	-.09	.13	.07
Within-person level				
Work challenges	-.01	.04 [†]	-.02	-.03*
Language barriers	-.01	-.02	.00	-.01
Intercultural relations	-.04*	.03	.04**	-.02
Discrimination	-.05*	.07***	.01	-.04**
Cultural isolation	.02	-.01	.00	-.02
Physical activity	.15***	-.12***	-.02 [†]	.03 [†]
Work Challenges × Physical Activity	-.03	-.00	-.01	-.02
Language Barriers × Physical Activity	.02	-.02	-.00	-.02
Intercultural Relations × Physical Activity	.00	-.03	-.01	-.03
Discrimination × Physical Activity	.03	-.03	-.04**	-.02
Cultural Isolation × Physical Activity	-.04*	.01	-.01	-.02
Participation day	-.02	-.01	-.02 [†]	.02 [†]
Typicality of day	.07	.06	-.04	-.04
General stress	-.31***	.33***	-.06***	-.05***
Between-person level				
Work challenges	-.03	-.07	-.14	.15
Language barriers	-.01	.07	-.04	-.07
Intercultural relations	-.01	.02	.20*	.05
Discrimination	-.01	.10 [†]	-.07	-.23**
Cultural isolation	-.10*	.10*	.06	-.06
Physical activity	.11**	-.12***	.01	-.05
Work Challenges × Physical Activity	-.01	-.04	-.01	-.10
Language Barriers × Physical Activity	.06	.05	-.00	-.09
Intercultural Relations × Physical Activity	-.12	.00	-.01	-.01
Discrimination × Physical Activity	-.02	-.02	-.04**	.06
Cultural Isolation × Physical Activity	.02	.06 [†]	-.01	.04
General stress	-.31***	.33***	-.18**	-.13**
Age	.03	-.14***	-.01	.09 [†]
Gender (ref. female and nonbinary)	.02	-.01	-.20	.30*
Education (ref. high)				
Medium education	-.00	-.13	.01	.12
Low education	-.23	.26	.45	-.22
Subjective SES	-.14**	.04	-.10 [†]	-.02
General fitness	.10*	-.01	.08	.13*
Competitive sports (ref. no)	.25	.13	-.32	-.27
Language group (ref. German)				
Turkish	.12	.22 [†]	-.36 [†]	-.44*
Russian	.13	.03	.08	-.07
Random effects				
Residual variance	.36	.43	.20	.24
Intercept variance	.29	.17	.60	.58
ICC	.45	.29	.75	.71
<i>N</i>	250	250	250	250
Observations	1,379	1,379	1,379	1,379
Marginal <i>R</i> ² / Conditional <i>R</i> ²	.322 / .626	.383 / .559	.187 / .796	.193 / .763

Note. The presented values are standardized regression coefficients β . All continuous within-person variables are person-mean centered, and between-person variables are grand-mean centered. Coefficients with *p* values < .05 are highlighted in bold. *N* = number of participants. ICC = Intraclass correlation coefficient;

SES = socioeconomic status.

[†]*p* < .10. **p* < .05. ***p* < .01. ****p* < .001.

Table S3.8*Additional Analysis: Replication of Model 2 with Aggregated Measures*

Predictors	Cultural identity fluctuations	
	Ethnic identity fluctuations	National identity fluctuations
(Intercept)	-.07	.11
Aggregated within-person variables		
Acculturative stress	.01	.01
Physical activity	-.08	-.11
Acculturative Stress × Physical Activity	.08	-.01
General stress	.20**	.10
Between-person level		
Age	.10	-.00
Gender (ref. female and nonbinary)	-.17	-.06
Education (ref. high)		
Medium education	.29 [†]	.15
Low education	-.03	-.27
Subjective SES	-.03	-.11 [†]
General fitness	-.01	.06
Competitive sports (ref. no)	.77*	.39
Language group (ref. German)		
Turkish	.11	-.23
Russian	-.02	-.18
Observations	250	250
Marginal R^2 / Conditional R^2	.093 / .043	.082 / .031

Note. The presented values are standardized regression coefficients β . All continuous variables are mean-centered. Coefficients with p values < .05 are highlighted in bold. SES = socioeconomic status.

[†] p < .10. * p < .05. ** p < .01.

Table S3.9*Additional Analysis: Replication of the Exploratory Analysis with Aggregated Measures*

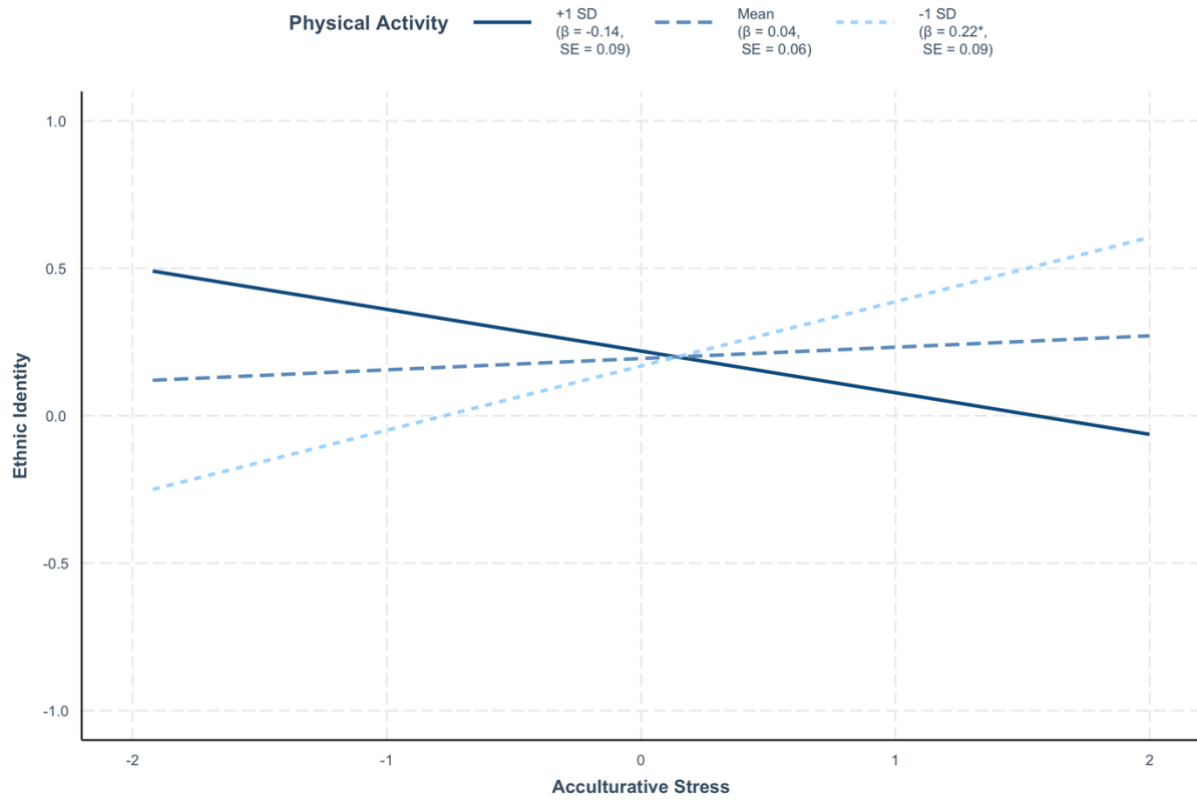
Predictors	Well-being	
	Positive affect	Negative affect
(Intercept)	-.15	-.08
Aggregated within-person variables		
Ethnic identity fluctuations	-.13*	.12*
National identity fluctuations	.07	.03
Acculturative stress	-.14*	.25***
Ethnic Identity Fluctuations × Acculturative Stress	.03	.05
National Identity Fluctuations × Acculturative Stress	-.00	-.07
General stress	-.42***	.42***
Between-person level		
Age	.05	-.20***
Gender (ref. female and nonbinary)	.06	-.03
Education (ref. high)		
Medium education	.08	-.19
Low education	-.29	.53 [†]
Subjective SES	-.18**	.06
General fitness	.12 [†]	-.01
Competitive sports (ref. no)	-.13	-.00
Language group (ref. German)		
Turkish	.20	.23
Russian	.17	.09
Observations	250	250
Marginal R^2 / Conditional R^2	.306 / .262	.446 / .410

Note. The presented values are standardized regression coefficients β . All continuous variables are mean-centered. Coefficients with p values < .05 are highlighted in bold. SES = socioeconomic status.

[†] p < .10. * p < .05. ** p < .01.

Figure S3.1

Results of the Simple Slope Analyses for Significant Between-Person Interactions



Note. Relationship between acculturative stress and ethnic identity moderated by physical activity. Correlation results are based on standardized data. All predictors presented are on the between-person level and grand-mean centered.

** $p < .01$.

General Discussion

In this dissertation, I investigated discrimination as a crucial factor driving social inequalities in mental health. My research specifically focused on examining the immediate, short-term, and long-term effects of discrimination on mental health, with a particular emphasis on establishing causality. This work includes a comprehensive review of theories and mechanisms linking discrimination to mental health outcomes, including a meta-analytical synthesis of the experimental evidence and the examination of potential effect moderators. Additionally, I investigated health behaviors as both pathways and protective factors. In sum, this dissertation investigated whether, when, and how discrimination impacts mental health and identified health behaviors as important levers to mitigate social inequalities in mental health. In the following, I will first summarize the main findings from the three individual studies that comprise this dissertation and discuss their theoretical implications. I will then evaluate the strengths and limitations of the research program and derive avenues for future research and practical implications.

Summary of Findings

In Manuscript 1, I conducted a systematic review of contemporary psychological theories that link discrimination to mental health. Current empirical research is predominantly based on stress and coping approaches, considering discrimination as a psychosocial stressor that triggers a biopsychosocial and behavioral stress response, which can lead to reduced mental health (Pascoe & Smart Richman, 2009; D. R. Williams & Mohammed, 2009). The minority stress theory (Meyer, 2003) further emphasizes how discrimination and other minority-specific stressors contribute additional layers of stress beyond general life stressors, resulting in an increased mental health burden and inequalities. Moreover, theories of social group identification shift the focus to social interrelations and view discrimination as a threat to psychological needs such as the need for esteem (according to social identity theory by Tajfel & Turner, 1979) or belonging (as outlined in the multimotive theory of rejection by

Smart Richman & Leary, 2009), both of which are critical for mental health. Importantly, all the outlined theories capture crucial aspects of discrimination and emphasize the diversity of mechanisms through which discrimination can impact mental health.

Besides this theoretical review, I also quantified the immediate effects of discrimination through a systematic meta-analysis of experimental studies and tested moderators of the effect in Manuscript 1. Utilizing a three-level random-effects model, I synthesized 73 randomized controlled trials (involving 12,097 participants and 245 effect sizes) in which discrimination was experimentally manipulated. The results show a robust effect of experimentally induced discrimination on mental health. Moderator analyses indicated that discrimination manipulated as pervasive across context and time had stronger effects than isolated incidents of discrimination. There was also a statistically non-significant trend showing stronger effects of discrimination targeting marginalized compared to non-marginalized identities (e.g., sexism targeting women versus men, respectively). Subsequent subgroup analyses confirmed this trend, demonstrating a significant overall effect of discrimination on mental health only for discrimination targeting marginalized identities, not non-marginalized identities. Gender and age did not moderate the effect; however, the predominantly young, highly educated female adult samples limited robust testing of these moderators. Further, exploratory subgroup analyses indicated that discrimination had the largest effects on negative externalizing mental health outcomes (e.g., anger, hostility) and negative distress-related outcomes (e.g., psychological distress, negative affect). Discrimination did not impact positive well-being (e.g., positive affect, life satisfaction) or self-directed outcomes (e.g., self-esteem, shame). Notably, by creating a first taxonomy of experimental paradigms in this systematic meta-analytic review, I was able to examine differential effects for the identified paradigms through exploratory subgroup analyses: More ecologically valid manipulations of discrimination, such as salience induction or vicarious experiences paradigms, showed a stronger overall effect compared to direct experiences of

discrimination in lab settings, which are under high ethical restrictions and tend to be highly artificial.

In Manuscript 2, I investigated the long-term effects of perceived discrimination on well-being and the mediating role of health behaviors—both protective (physical activity, nutrition, sleep) and risky (substance use). This study utilized a large sample of adolescents ($N = 9,957$, $M_{\text{age}} = 14.90$) from four European countries, assessed annually over three years. Results showed that adolescents reported the most frequent instances of discrimination in the school context, more than in other life domains such as public transportation, retail and hospitality, and law enforcement and security. As expected, perceived discrimination predicted decreased well-being two years later, as well as less protective and more risky health behaviors one year later, even when controlling for key confounders (i.e., age, gender, socioeconomic status, migration status, religious affiliation). Nutrition and sleep mediated the relationship between perceived discrimination and mental health, whereas no mediation effects were observed for physical activity and substance use. This lack of mediation may be due to the broad measurements and, thus, low variability in physical activity and substance use within this study. Nonetheless, given the harmful effects of perceived discrimination on all assessed health behaviors, and considering health behaviors as key determinants of mental health, these behaviors likely represent critical pathways through which discrimination impacts mental health. Moreover, the persistence of negative effects of discrimination on mental health and health behaviors, even after accounting for structural indicators of social inequality and potential discrimination (i.e., gender, socioeconomic status, migration status, and religious affiliation), underscores the importance of examining subjective experiences, particularly perceived discrimination, rather than solely relying on objective indicators in health research.

In Manuscript 3, I examined the short-term associations of everyday discrimination experiences and other minority stressors with well-being in a daily diary study ($N = 266$, $n =$

1,473). I focused on physical activity as a protective factor buffering the adverse well-being effects of migrant acculturative stressors, such as perceived discrimination, work challenges, language barriers, interpersonal conflicts due to cultural habits, and cultural isolation. Well-being was operationalized through daily variations in positive and negative affect.

Additionally, cultural identity, defined as the sense of belonging to both one's culture of origin (ethnic identity) and the culture of residence (national identity), was assessed as a key aspect of mental health in the context of international migration. By controlling for general daily stress, this study highlighted the unique impacts of discrimination and acculturative stress beyond typical daily stressors. The use of centered predictors, relative to individual-person means, facilitated the analysis of within-person relationships. Findings showed that daily acculturative stress was associated with decreased well-being and national disidentification but not with ethnic identification. Additional nuanced analyses showed that these effects were primarily driven by perceived discrimination, with other acculturative stressors playing a lesser role. The observed larger between-person effects suggest that the small within-person effects of acculturative stress likely accumulate over time. Being physically active was linked to higher well-being and showed a statistically non-significant tendency to buffer the increase of negative affect associated with acculturative stress. These protective effects were primarily evident at the within-person level, underscoring the acute benefits of physical activity. Being physically active was not associated with ethnic identity but in tendency with national identity; however, it did not buffer the effects of acculturative stress on cultural identity. Exploratory analyses indicated a positive association between cultural identification and well-being; however, stronger cultural identification on a given day exacerbated the negative relationship between acculturative stress and well-being, highlighting the complex role of cultural identity for well-being.

Integration of Findings and Theoretical Implications

In the following, I will align the key findings of the three manuscripts that comprise this dissertation with the four overarching research objectives of this research program, including 1) providing a systematic overview of theories and mechanisms underlying the mental health effects of discrimination, 2) examining the causality and 3) temporal dynamics of these effects, and 4) investigating the role of health behaviors as potential mechanisms and moderators.

Theoretical Perspectives on Discrimination and Mental Health

In Manuscript 1, I conducted a thorough examination of psychological theories that link discrimination to mental health. This systematic and critical examination of theories and mechanisms can not only stimulate further empirical research but also advance theoretical developments. To gain a more holistic understanding of discrimination as a threat to mental health and its underlying mechanisms, it is essential to integrate elements from different theoretical perspectives. Current theoretical perspectives include stress-coping theories (e.g., Berjot & Gillet, 2011; Major & O'Brien, 2005), which adopt an individualistic approach, and social identity approaches (Tajfel & Turner, 1979), which emphasize social processes. While empirical studies predominantly focus on stress-coping approaches, I argue that both perspectives are essential for understanding discrimination's detrimental impacts. Integrating central theoretical assumptions could enrich our understanding of discrimination's complex dynamics, resulting in more effective interventions. I propose considering elements from social identity theory and its expansions to enrich predominant stress-coping approaches and offer three specific advancements: 1) a refined understanding of identity, 2) consideration of the social consequences of discrimination, and 3) a broader understanding of coping.

First, from a stress-coping perspective, social identity is typically conceptualized as a protective factor. For example, the minority stress theory (Meyer, 2003) suggests that group solidarity and cohesion can protect mental health from the stress induced by discrimination.

Social support from in-group members, potentially including a reappraisal of negative cognitive and emotional responses to discriminatory experiences, is assumed to be an important coping resource (Meyer, 2003). In contrast, social identity approaches suggest that high group identification can also increase vulnerability and exacerbate the negative consequences of identity-threatening discrimination experiences because the group identity becomes more central to the individual's self-concept. In Manuscript 3, I explored social identity as a moderator of the mental health effects of discrimination. While social identity was positively related to mental health amid discrimination stress, it did not buffer stress as postulated by minority stress theory. Instead, it exacerbated the negative association between discrimination and mental health as postulated by social identity theories. Whether the identification with a minority group exacerbates or buffers the mental health impacts of discrimination might be further explained by the perceived legitimacy of this discrimination. Judging experienced discriminatory actions as legitimate could exacerbate the negative effects, whereas it might have a buffering effect if affected individuals perceive it as illegitimate (Hansen & Sassenberg, 2011). These insights emphasize the importance of considering social identity not merely as a straightforward protective factor but as a complex construct that can both protect and harm, depending on the context and individual appraisal of perceived discrimination.

Second, it is essential to recognize discrimination not merely as a psychosocial stressor but as a form of negative intergroup behavior. The findings in Manuscript 1 reveal the strongest immediate consequences of exposure to discrimination for other-directed negative emotions such as anger and hostility. The expression of aggressive emotions and behaviors in response to perceived discrimination can potentially reinforce negative stereotypes associated with marginalized groups and perpetuate further discriminatory behaviors in perpetrators. This can result in a vicious cycle where discrimination is continuously validated, deepening the divide between social groups. Such patterns of polarization are evident on social media,

where perceived discrimination exacerbates verbal aggression (English et al., 2020; Lewis et al., 2015) and political polarization (e.g., Yarchi et al., 2021). One effective method to address these cycles of aggression and counter-aggression might be to foster positive intergroup contact, which has been shown to reduce hostility and build trust and empathy, thereby reducing discrimination and enhancing social cohesion (Hewstone, 2015; Pettigrew et al., 2011).

Third, social identity approaches also emphasize coping strategies that are moderated by group identity and social support, such as collective action (van Zomeren et al., 2008). Collective action on the group level is an active response, which requires high group efficacy and entails significant social costs. Nevertheless, it has the potential to enhance individual and social well-being (Cronin et al., 2012; Sohi & Singh, 2015) and lead to social change (Louis, 2009). Collective coping processes and understanding discrimination as a negative intergroup behavior underscore the necessity of examining discrimination's effects beyond individual mental health to include collective well-being and social action. Such aspects are often overlooked in traditional, more individualistic stress-coping models.

Establishing Causality of Discrimination's Impact on Mental Health

This dissertation examined the causal effects of discrimination on mental health, drawing on both experimental and longitudinal methods to establish a stronger foundation for causal inference. Prior meta-analytic reviews (e.g., Pascoe & Smart Richman, 2009; Schmitt et al., 2014) consistently demonstrated negative correlations between self-reported discrimination experiences and mental health. However, because these studies are primarily based on cross-sectional correlational data, they do not allow for causal inferences. Additionally, self-reported instances of discrimination and mental health measures can be biased by subjective perceptions and actual negative consequences of discrimination, such as worse housing or quality of care. By leveraging the high internal validity and excellent control of confounding variables in randomized controlled trials, Manuscript 1 provides meta-

analytic evidence for the direct causal effects of discrimination on mental health. This finding contrasts with the only previous meta-analysis of experimental studies on discrimination and mental health, which found no significant overall effect (Schmitt et al., 2014). There are likely methodological explanations for this discrepancy: The meta-analysis in Manuscript 1 had broader inclusion criteria and included various research paradigms. Due to these broader criteria and nearly 10 additional years of research and methodological advancements, such as the use of multilevel structures, more studies and effect sizes were included, leading to different results. Thus, this meta-analysis is a crucial and necessary update to the previous meta-analysis of experimental studies (Schmitt et al., 2014) and the first to demonstrate the detrimental causal effects of discrimination on mental health based on experimental data. Despite these strengths, experimental methods come with their limitations. Ethical considerations and controlled conditions of laboratory settings may not accurately reflect real-world discrimination experiences. To further investigate this assumption, I developed the first taxonomy of experimental paradigms and explored their unique effects on mental health in additional subgroup analyses in Manuscript 1. The findings supported this idea and showed only a statistically non-significant trend for the effects of the most experimentally controlled and artificial manipulations of discrimination. Conversely, manipulations that involved recalling real autobiographical experiences or presenting real-world examples demonstrated clear detrimental effects on mental health.

To investigate causality in a more ecologically valid setting, I utilized longitudinal panel data and explored the effects of perceived discrimination on mental health over two years in Manuscript 2. Although this design does not establish causality as effectively as experimental studies, it offers higher ecological validity and provides more evidential value than cross-sectional designs (O’Laughlin et al., 2018). The findings support the causal impact of discrimination on mental health: Even in observational data with a two-year assessment interval, and after controlling for important confounding factors that also represent objective

indicators for inequality (i.e., gender, socioeconomic status, migration status, religious affiliation), the detrimental long-term effects of perceived discrimination were evident.

Temporal Dynamics of Discrimination's Impact on Mental Health

Utilizing a multi-methodological approach, I aimed to investigate the temporal dynamics of the mental health effects of discrimination. I explored how its impacts manifest across different time scales, combining experimental studies to capture immediate impacts (Manuscript 1), intensive longitudinal methods to investigate short-term daily effects (Manuscript 3), and longitudinal panel data to examine long-term consequences over two years (Manuscript 2).

All included experimental studies in the meta-analysis in Manuscript 1 assessed mental health outcomes immediately after the manipulation, representing direct immediate effects of discrimination. The findings show that discrimination triggers immediate, adverse reactions, primarily manifesting as negative mental health outcomes, such as externalizing emotions (e.g., anger, hostility) and psychological distress (anxiety, negative affect). In this meta-analysis, discrimination did not have an immediate effect on positive well-being related outcomes (e.g., positive affect, life satisfaction) or self-directed outcomes (e.g., self-esteem, shame). Contrasting these immediate effects, the findings of Manuscripts 2 and 3 show that discrimination, in the longer term, does affect aspects of mental health related to positive well-being. Specifically, Manuscript 3 showed that daily experiences of discrimination were associated with less well-being (i.e., both less positive and more negative affect) on a given day, and Manuscript 2 that reported discrimination predicted less well-being (i.e., life satisfaction) two years later (controlling for life satisfaction one year later and other important confounding factors).

Most theories do not focus on the immediate effects of discrimination and often do not specify mechanisms leading to varied immediate mental health outcomes. For example, the multimotive theory of rejection (Smart Richman & Leary, 2009) focuses on the longer-term

effects of discrimination but also includes immediate responses such as rejection-specific emotions (“hurt feelings”), decreased state self-esteem, and increased negative affect. However, it does not describe externalizing other-directed emotions such as anger or hostility. To the best of my knowledge, no theory explicitly addresses the immediate effects of discrimination. The underlying mechanisms and specific aspects of mental health that are harmed immediately versus in the longer term, and their interplay over time remain insufficiently understood in both current research and theoretical frameworks. While short-term experiences of negative externalizing emotions such as anger can be functional and adaptive, persistent and severe anger can have maladaptive effects on individual mental health and behavior, as well as on the community (e.g., Barrett et al., 2013; Ramírez & Andreu, 2006). Given the recurrent nature of discrimination, often experienced multiple times a day (e.g., English et al., 2020), it is crucial to explore the underlying mechanisms of these immediate effects in future research. This would help to develop more effective interventions addressing the nuanced impacts of discrimination across different time frames.

The Role of Health Behaviors

This dissertation identified health behaviors as crucial pathways and protective factors for the mental health impacts of discrimination. In Manuscript 2, I examined how health behaviors function as mediators between perceived discrimination and mental health over a two-year period. Prior research, predominantly from the US, has focused on risk behavior, particularly substance use, as a mediator (systematic reviews by Cave et al., 2020; Pascoe et al., 2022). Expanding on this, I utilized panel data from adolescents in four European countries—Germany, England, Netherlands, and Sweden—and assessed not only substance use but also physical activity, healthy nutrition, and sleep quantity as protective health behaviors. By examining adolescents transitioning to early adulthood (ages 14 to 18), Manuscript 2 uncovers the long-term effects of discrimination on health behaviors and mental health in a particularly vulnerable and formative developmental life phase. The findings indicated that

healthy nutrition and sleep quantity one year later partially mediate the relationship between discrimination and mental health outcomes two years later, a novel insight given that prior research has predominantly focused on substance use. Nutrition and sleep have not previously been considered mediators for the effect of discrimination on mental health. However, there is emerging evidence from related areas that supports these findings. For example, a recent study showed that peer bullying in childhood negatively impacts mental health in late adolescence, with protective behaviors—physical activity, nutrition, and sleep in middle adolescence—acting as longitudinal mediators (Tsomokos & Slavich, 2024). Importantly, discrimination also predicted more substance use and less physical activity one year later. Since the investigated health behaviors represent important determinants of mental health, the absence of expected mediation effects might be due to methodological limitations, such as low variability in these measures, or it could suggest that the effects of health behaviors on well-being manifest over longer time periods than those captured in this study (e.g., Burdette et al., 2017) or even more acutely (e.g., Zschucke et al., 2015).

The adverse effects of discrimination on protective health behaviors might even amplify the mental health effects of discrimination because these behaviors have the potential to buffer discrimination's adverse effects. In Manuscript 3, I examined the stress-buffering function of health behaviors, specifically physical activity, for well-being against discrimination, extending beyond previous studies that have typically focused on general stress (e.g., Flueckiger et al., 2016). Unlike earlier research that often used between-person approaches (e.g., Mata et al., 2012; White et al., 2017), I utilized a daily diary methodology to capture the day-to-day variability within individuals. Such within-person analyses provide insights into how discrimination, physical activity, and well-being (i.e., operationalized as positive and negative affect) unfold daily, highlighting the dynamic interplay of these variables in real-life contexts. The findings indicated that daily physical activity was associated with higher levels of well-being on that day amid discrimination. These positive

associations were mainly observed at the within-person level (but not between-person), underscoring the more acute benefits of physical activity. Being physically active on a given day did not buffer the effects of discrimination on well-being, except for a statistically non-significant trend toward buffering negative affect. The stress-buffering capacity of physical activity may depend more on qualitative aspects, such as type and context, rather than the quantitative dimensions assessed in this study. Interestingly, Flueckiger et al.'s (2016) daily diary study found that physical activity, assessed with a similar measure, buffered the negative relation between general stress and affect. One possible reason for this discrepancy is the difference in sample composition: Flueckiger et al.'s study included only students, while the sample in Manuscript 3 was more heterogeneous regarding occupation. In this more diverse sample, unpleasant or compulsory physical activities, such as in work contexts, are more likely to be reported and captured by the utilized measure (e.g., Elshahat et al., 2023). These types of activities do not have the same positive impact on mental health as more pleasant, voluntary activities (White et al., 2017). Furthermore, physical activity might also have a buffering effect above and beyond its physiological effects. Discrimination is not only a psychosocial stressor but also threatens the need to belong (Smart Richman & Leary, 2009), making the social benefits of physical activity particularly relevant. Previous research has shown that physical activity, especially in the context of international migration, supports integration and mental health, particularly, through social aspects such as team composition, sense of belonging, and the motivational environment provided by the team (e.g., Elshahat et al., 2023; Hatzigeorgiadis et al., 2013). Given that physical activity can be enhanced through large-scale behavioral change programs (Heath et al., 2012; Lane et al., 2021), it might represent a promising protective factor against the harmful effects of discrimination in everyday life.

This dissertation emphasizes the role of health behaviors as both pathways and protective factors in the face of discrimination, thereby highlighting them as potential public

health levers to reduce mental health inequalities. To enhance our understanding of the interplay of discrimination, mental health, and health behaviors, this dissertation investigates their acute and long-term associations. I integrated theories and methodologies from discrimination and health behavior research—a connection mostly overlooked in prior research. I introduced discrimination as a pivotal social determinant of health behaviors, a perspective that expands the conventional frameworks on health behaviors. The theoretical landscape concerning the social processes influencing health behaviors is not cohesive yet. For instance, Rhodes and Beauchamp (2024) introduced a taxonomy of social determinants of health behaviors that includes factors such as social support, social appraisals, and social identification—all of them potentially influenced by discrimination. However, their framework does not explicitly incorporate discrimination, suggesting a gap in our understanding of how social dimensions critically affect health behaviors. I therefore propose discrimination as a central factor influencing all social determinants of health behaviors. The omission of discrimination as a critical determinant in studies of health behaviors may contribute to why many prevention and intervention programs are limited in effectively reaching and benefiting individuals impacted by social disadvantage (e.g., Althoff et al., 2017; Western et al., 2021), thereby exacerbating mental health inequalities.

Strengths, Limitations, and Future Research

When discussing the empirical results and theoretical implications of this research program, it is crucial to consider its methodological and theoretical strengths and limitations and their implications for future research. By comprehensively examining these aspects, I contributed to the understanding of the complex interplay of discrimination, health, and health behaviors, not only for advancing scientific research but also for informing policy and developing strategies to reduce inequalities and enhance mental health across diverse populations, which I will discuss the practical implications of this research program in the subsequent section.

Strengths and Future Research

This dissertation displays three core strengths. First, employing diverse operationalizations of discrimination enriches our understanding of discrimination and its effects and gives directions for future research. In Manuscript 1, I showed that experiences of discrimination have detrimental effects on mental health. This finding underlines the understanding that discrimination can negatively impact mental health even if it is not consciously perceived as discriminatory by the affected individual (Bailey et al., 2017). However, when unfair treatment and disadvantage are perceived as discrimination, it can threaten one's sense of value and place in society, leading to additional negative mental health effects (cf. Schmitt et al., 2014). In Manuscripts 2 and 3, I showed the mental health effects of subjective perceptions of discrimination beyond general stress (Manuscript 3) and central structural indicators of inequality (Manuscript 2). These findings imply that merely capturing the effects of objective indicators of inequality might be insufficient because the subjective perception of discrimination also plays a crucial role in affecting mental health and health behaviors. Moreover, the findings of Manuscript 1 highlight the importance of defining discrimination not solely as unfair treatment, but unfair treatment rooted in political, social, and economic power imbalances: Unfair treatment based on non-marginalized identities did not significantly impact mental health, whereas it had a significant impact when directed at marginalized identities. Hence, discrimination is not merely a series of isolated events of unfair treatment but operates within a broader framework of social hierarchies and systemic inequalities (see also Krieger, 2014; 2021).

Second, a major strength of this dissertation is the use of a multi-methodological interdisciplinary approach that combines a systematic meta-analysis of experimental studies (Manuscript 1), daily diary methodology (Manuscript 3), and long-term panel data (Manuscript 2). This approach effectively balances the limitations inherent in each approach with the unique strengths of others. For instance, the included experimental studies in the

meta-analysis in Manuscript 1 relied mainly on small convenience samples. I overcame the lower statistical power typical of single experimental studies by synthesizing these experiments using meta-analytic methods. Thus, the overall effect estimate is based on a large sample of 245 effect sizes from over 12,000 participants. Additionally, the high statistical power from the representative panel data in Manuscript 2 ($N = 9,957$ individuals) and multiple observations within individuals in Manuscript 3 ($n = 1,473$ observations) complement this effect. Similarly, while experiments provide excellent control over confounding variables but suffer from low ecological validity, the daily diary approach utilized in Manuscript 3 captures real-life processes in natural settings. By collecting daily diary data in the field, this approach also allowed for the use of tailored measurement instruments and targeted sample recruitment specific to the research questions. In contrast, the utilized methodology in Manuscripts 1 and 2 did not allow for such flexibility in measurement selection and partially relied on broad, one-item measures for well-being and health behaviors, which could potentially influence the accuracy and depth of the results. Moreover, the long one-year time gaps in the assessments of Manuscript 2 could lead to response bias, as discrimination is often experienced multiple times a day in subtler forms (e.g., English et al., 2020). This limitation is mitigated by the immediate measurement of mental health outcomes directly after the induction of discrimination in Manuscript 1 and the daily assessments in Manuscript 3. The multi-faceted methodology of this research program enhanced our understanding of both between-person and within-person effects, allowed the exploration of different temporal resolutions, and supported robust conclusions on the causality of discrimination's effects on mental health.

Third, a significant strength of this dissertation is its strong commitment to open science practices, which ensures transparency and fosters collaboration and inclusivity in research. The meta-analytic review in Manuscript 1 was preregistered and provides open scripts and data through the Open Science Framework (OSF). The meta-analysis is also

implemented as a Community Augmented Meta-Analysis (CAMA), an open repository for meta-analytic data offering sophisticated analysis tools for dynamic interaction with the data and the capability to augment findings by adding new data (Burgard et al., 2022). Due to the interdisciplinary nature of the panel study in Manuscript 2, which involves sociological data and methods, no preregistration was conducted. In sociology, the benefits and limitations of preregistration are still debated, and it is not widely adopted (e.g., Manago, 2023). However, the data are publicly available, and open scripts are provided via OSF to ensure reproducibility. The daily diary study in Manuscript 3, which involved original data collection, was preregistered, and both the scripts and data are openly accessible via OSF. These open science practices enhance the reproducibility of findings and facilitate augmentation (i.e., addition of new data), thereby strengthening the research's impact.

Limitations and Future Research

Aside from its important strengths, this dissertation is not without limitations. First, despite efforts to diversify the samples across the three studies by varying age, types of discrimination, and geographical regions, and by employing multilingual data collection in Manuscript 3 to include participants with recent migration experiences—a population often overlooked in psychological research—the samples still predominantly comprised young women with higher education from WEIRD (Western, Educated, Industrialized, Rich, and Democratic) countries. This selective sampling likely led to an underestimation of the mental health effects of discrimination and limited the generalizability of results to all marginalized populations. This issue not only reflects a limitation specific to this dissertation but also highlights broader challenges within psychological research (see e.g., Roberts, 2024). Sampling methods are not merely technical decisions; they are tied to underlying power dynamics and affect the efficacy and safety of treatments for marginalized populations (e.g., Blöchl et al., 2024; Finegan et al., 2018; van Dyck et al., 2023; Western et al., 2021). Hence, overlooking certain populations can exacerbate health inequalities. Future research could

benefit from increased diversity among researchers (Roberts, 2024) and direct community engagement using participatory methods (Greenhalgh et al., 2019) to ensure a broader representation of experiences, which is essential for effectively recruiting diverse samples. More inclusive sampling methods, though potentially costlier, are crucial not only for ensuring the effectiveness of potential intervention approaches but also for fostering trust, cultural appropriateness, and inclusivity (e.g., Blöchl et al., 2024). Advocating explicitly for these practices in research grants, as well as collaboration and resource sharing among researchers, could be a way to address this challenge.

Second, a significant limitation of this dissertation is the lack of explicit consideration of intersectionality in assessing the effects of discrimination. While in Manuscript 1, I attempted to explore interactions between commonly assessed dimensions of inequality, such as gender and age, as an initial step towards an intersectional perspective, the selectivity of the samples unfortunately restricted a more thorough investigation of these interactions. In Manuscript 2, subjective experiences of discrimination in general were broadly assessed, potentially encompassing intersectional experiences, yet these were not distinctly analyzed and remained more implicitly addressed. Manuscript 3 focused exclusively on discrimination based on migration background, thus neglecting other intersecting identities that may influence discrimination experiences and their mental health effects. This focus on discrimination based on only one marginalized identity may lead to an underestimation of mental health effects by individuals facing multiple concurrent oppressions (Fagrell Trygg et al., 2019; Lewis & Van Dyke, 2018). Adequately addressing intersectionality requires more than merely aggregating social categories; it involves understanding the convergence and interaction of diverse social identity factors that affect individuals' experiences (Hankivsky & Christoffersen, 2008). Although there have been some initial attempts to quantify intersectionality, such as measures for intersectional microaggressions by Singh et al. (2021), comprehensive research on how intersectional inequalities impact mental health remains

limited, both in scope and in methodological development (scoping review by Fagrell Trygg et al., 2019). Future research could benefit from advanced statistical techniques such as decomposition analyses and decision trees (review by Bauer et al., 2021) to more effectively identify and analyze the specific impacts of intersectional discrimination on mental health, ultimately helping to identify high-risk groups.

Third, another critical ‘second order’ limitation concerns the public health implications and societal impacts associated with potentially underestimating the strength of discrimination’s effect on mental health due to methodological constraints. The studies within this dissertation generally report only small to moderate effect sizes. This modest range could be attributed to the selectivity of the samples, which likely masks the full extent of discrimination's effects. Additionally, the observational nature of the methodologies used—such as the longitudinal panel study with annual assessments in Manuscript 2 and the daily diary approach in Manuscript 3—tends to reveal smaller effects than experimental designs. In Manuscript 1, where I aggregated effect sizes from experimental studies, the resultant effect sizes varied from small to moderate, though some subgroup analyses indicated even large effects, for instance, for heterosexism impacting mental health. Given the pervasiveness of discrimination in the daily lives of marginalized individuals (English et al., 2020), along with the cumulative impact of these experiences over a lifetime (Reskin, 2012) and even potential transgenerational transmission (Hankerson et al., 2022; Lugo-Candelas et al., 2021), these effects represent a significant threat to individual and collective mental health. It is also important to note that even small effect sizes can have substantial public health implications when considering the widespread prevalence of discrimination (Reinehr et al., 2016). Thus, while the effects may appear modest, their broader impact on population health can be profound.

Practical Implications

The findings of this dissertation emphasize that discrimination is a pervasive everyday experience for affected individuals that impacts mental health through direct, vicarious, and recollected autobiographical experiences. To mitigate these effects and address mental health inequalities, it is critical to not only support affected individuals but also implement interventions targeting their social environments and structural changes. Health behaviors have been identified as both outcomes of discrimination and mediators of its adverse mental health consequences, as well as protective factors potentially buffering these adverse effects. Given their modifiability, focusing on health behaviors presents a promising avenue and an essential lever for public health strategies to reduce mental health inequalities. Intervention and prevention programs should target the determinants of health behaviors influenced by discrimination, such as self-efficacy (Cavaliere et al., 2019), social support (Doyle & Barreto, 2023; Umberson et al., 2010), or maladaptive coping strategies (Brown et al., 2022; Gibbons et al., 2018). It is vital that health behavior change interventions are tailored to at-risk populations, considering intersectionality. High-risk strategies that focus on structural and environmental factors are more likely to reduce mental health inequalities than programs targeting individual behavior change (e.g., educational programs), which often disproportionately benefit more advantaged populations, potentially exacerbating existing inequalities (e.g., Western et al., 2021; Woodward & Kawachi, 2000).

Adolescence might be a strategic window of opportunity for intervention and prevention efforts to reduce mental health inequalities, potentially leading to positive long-term effects throughout the life span and reducing social inequalities more broadly. This dissertation shows that discrimination impacts adolescents significantly, affecting both their mental health and their health behaviors, in a phase when they are particularly vulnerable to discrimination's effects (e.g., Somerville, 2013) but also crucial for establishing enduring health behavior patterns (Viner et al., 2012). Schools, as central public institutions in Western

countries, provide a strategic platform for reaching disadvantaged groups—which is still an ongoing challenge in health research—and addressing discrimination's effects on mental health and, more broadly, on academic performance (Stevens et al., 2018) and social integration (Doyle & Barreto, 2023).

Moreover, to effectively address discrimination and its underlying causes, efforts must extend beyond the individuals directly affected to the broader social and cultural contexts that sustain discriminatory practices. A promising approach could be empowering bystanders to intervene in discriminatory incidents, which supports targeted individuals actively and fosters a safe and inclusive environment for everyone (Dessel et al., 2017). Additionally, promoting positive intergroup contact, which can be facilitated through direct interactions or vicariously through media, can decrease prejudice and enhance empathy, contributing to a more inclusive society (Pettigrew et al., 2011). Implementing changes in cultural narratives and language can also reduce cultural prejudice and stereotypes, protecting the mental health of marginalized groups by diminishing the prominence and triggers of negative stereotypes (Braun et al., 2005; Chellappa, 2023).

Conclusion

This dissertation aimed to enhance our understanding of mental health inequalities by focusing on discrimination as a pivotal mechanism. Utilizing a multi-methodological approach, I examined the immediate, short-term, and long-term impacts of discrimination on mental health, affirming the causality of its effects. By integrating psychological and sociological theories and methods, this research identified health behaviors as both pathways through which discrimination affects mental health and protective factors against its harmful effects. Key contributions of this work to health psychology include recognizing discrimination as a significant social determinant influencing health behaviors and highlighting the need to focus on high-risk populations in research and in intervention and prevention programs. This dissertation also advances discrimination research by providing a

comprehensive synthesis of theories that connect discrimination to mental health outcomes, introducing the first taxonomy of experimental paradigms for inducing discrimination, and delineating how discrimination impacts various aspects of mental health across different timelines.

Despite ongoing personal and political efforts to reduce discrimination, it may be overly optimistic to expect a future entirely free of discrimination. Therefore, it remains critical to support and protect those who are particularly vulnerable to discrimination. Recognizing that some groups are more at risk, often have fewer protective resources, and are underrepresented in current research underscores the need for focused research and targeted preventive measures. Addressing health behaviors as both pathways and protective factors offers a promising route to mitigate the immediate and enduring effects of discrimination and promote greater equity in mental health.

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Statement of Co-Authors – Manuscript 1

We confirm that the following manuscript included in this dissertation was primarily conceived and written by Christine Emmer, doctoral candidate at the School of Sciences at the University of Mannheim:

Emmer, C., Dorn, J., & Mata, J. (2024). The immediate effect of discrimination on mental health: A meta-analytic review of the causal evidence. *Psychological Bulletin*, *150*(3), 215–252. <https://doi.org/10.1037/bul0000419>

We sign this statement to the effect that Christine Emmer is credited as the primary source of the ideas and the main author of the manuscript as she derived the theoretical and methodological background, was responsible for literature search and data extraction, implemented the statistical analyses, and contributed to improving and revising the manuscript. Julia Dorn contributed by writing and statistical analysis for the first draft. Jutta Mata contributed by providing supervision, conceptualization, and resources, as well as co-writing and revising the manuscript.

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Statement of Co-Authors – Manuscript 2

We confirm that the following manuscript included in this dissertation was primarily conceived and written by Christine Emmer, doctoral candidate at the School of Sciences at the University of Mannheim:

Emmer, C., Neumer, A., Kalter, F., & Mata, J. (2024). *Long-term discrimination effects on adolescent health behaviors and well-being in four countries* [Manuscript submitted for publication].

We sign this statement to the effect that Christine Emmer is credited as the primary source of the ideas and the main author of the manuscript as she derived the theoretical and methodological background, was responsible for the investigation, implemented the statistical analyses, and contributed to improving and revising the manuscript. Anna Neumer contributed through statistical analyses, data curation, and revising the manuscript. Frank Kalter provided resources and supervision. Jutta Mata contributed by providing resources and supervision, as well as co-writing and revising the manuscript.

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We confirm that the following manuscript included in this dissertation was primarily conceived and written by Christine Emmer, doctoral candidate at the School of Sciences at the University of Mannheim:

Emmer, C., Mann, F., Edelinski, K., & Mata, J. (2024). *Well-being and cultural identity in migrant acculturative stress: A daily diary study* [Manuscript submitted for publication].

We sign this statement to the effect that Christine Emmer is credited as the primary source of the ideas and the main author of the manuscript as she derived the theoretical and methodological background, was responsible for the investigation, implemented the statistical analyses, and contributed to improving and revising the manuscript. Frauke Mann contributed through statistical analyses, data curation, and revising the manuscript. Ksenija Edelinski contributed to the conceptualization and data collection. Jutta Mata contributed by providing conceptualization, resources, and supervision, as well as co-writing and revising the manuscript.

Frauke Mann

Ksenija Edelinski

Jutta Mata

“Not everything that is faced can be changed,
but nothing can be changed until it is faced.”

-

James Baldwin