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**Overconfident but yet well-calibrated and
underconfident: A research note on judgmental
miscalibration and flawed self-assessment***

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* An earlier version of this working paper was presented at the 20th conference on Subjective Probability Utility and Decision-Making (SPUDM 20) which took place in Stockholm, August 2005. Financial support from the Deutsche Forschungsgemeinschaft, SFB504, at the University of Mannheim is gratefully acknowledged. The paper has benefited from inspiring and stimulating talks with David Dunning, David Budescu, Denis Hilton, and Martin Weber. I also thank Adelson Piñón for helpful comments and insightful discussions.

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Overconfident but yet well-calibrated and underconfident:

A research note on judgmental miscalibration and flawed self-assessment*

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Abstract

The present paper addresses the question whether overconfidence is an individually stable phenomenon. A within-subjects design was used to investigate whether judgmental miscalibration also reflects tendency to make flawed self-assessments. While the former notion refers to the tendency of individuals to put unrealistic beliefs in their judgments, the latter concerns the tendency of individuals to make inaccurate evaluations of their abilities and performance. On the whole, the paper finds little support that those two tendencies should be related. Depending on the employed measurement, the participants were found to be simultaneously overconfident, well-calibrated, and underconfident.

Keywords: Academic performance; Calibration; Education; Overconfidence; Self-assessment

JEL Classification Code: A20; C90

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INTRODUCTION

In their everyday life people assess various issues associated with varying degrees of economic consequences, risk, significance, stress, and uncertainty. Of course, there are many ways to categorize those appraisals (cf. Abelson & Levi, 1985; Svenson, 1996). One alternative way is to simply distinguish between appraisals related to entities and selves. Some examples may clarify this distinction. Entity-related appraisals can be illustrated by the following issues: (1) estimating earnings of a company, (2) predicting the outcome of the World Cup in football, (3) deciding whether a job candidate should be hired. Thus, such appraisals are in a sense distal to the individual. In contrast, self-related appraisals are arguably proximal to the individual and concern issues like evaluating one's own abilities, knowledge, performance, and skills. Henceforward, entity- and self-related appraisals will be referred to as judgments and self-assessments, respectively. Scientific evidence suggests that people overestimate the correctness of their judgments and make flawed self-assessments, implying that they are overconfident. This paper aims to shed light on how those phenomena relate.

Over the years, there has been extensive research on whether individuals put realistic belief in their judgments of entities (for reviews see Lichtenstein, Fischhoff & Phillips, 1982; McClelland & Bolger, 1994). Specifically, the tendency of individuals to be judgmentally calibrated has been extensively studied. This notion of calibration refers to what extent individuals assign adequate confidence levels to their judgments. To be well calibrated, the level of confidence in judgments must agree with the accuracy of those. For example, when individuals say that they are 80% sure that their judgments are correct, it is theoretically expected that 80% of those are correct. Such a perfect match between confidence and judgmental abilities means good meta-cognition skills or awareness of knowledge boundaries (cf. Russo & Schoemaker, 2002). A vast body of studies shows that individuals typically state

confidence levels exceeding the accuracy of their judgments, implying that they are miscalibrated and, accordingly, overconfident (Lichtenstein et al., 1982; McClelland & Bolger, 1994; Koehler, Brenner & Griffin, 2002). This tendency of overconfidence holds also for experts in most fields, except for weather forecasters and bridge players who are known to be calibrated (cf. Bolger & Wright, 1992).

Basically, two approaches have been used to study judgmental calibration (Klayman, Soll, González-Vallejo & Barlas, 1999; Juslin & Olsson, 1999). Firstly, in the most commonly employed approach, participants face numerous of two-choice general knowledge questions (e.g., “Which of the following two cities is the capital of Australia: Sydney or Canberra?”). For each question, participants choose the alternative they think is correct and state their confidence in the choice on a scale, which often range from 50% to 100%. The second approach means that participants receive a list of general knowledge questions. For every question, they are asked to state an upper and lower limit such that they feel 90% sure that the limits cover the correct answers. This approach typically results in more extreme degree of overconfidence than when participants choose between two alternatives (Klayman et al., 1999). Nonetheless, a recent study suggests that the two approaches seem to give fairly consistent and coherent results (Budescu & Du, 2005).

It should be noted that the selection of questions has an impact on the degree of calibration. Hard and easy questions tend to be associated with over- and under-confidence (e.g., the tendency to have more correct judgments than expected by the assigned confidence) (Lichtenstein et al., 1982; Juslin & Olsson, 1999). Ideally, the questions should be sampled so that they are representative for the environment of the participants. Studies have shown that miscalibration disappears, or is reduced, when participants judge tasks that have been randomly drawn from a population of representative knowledge questions (Gigerenzer, Hoffrage & Kleinbölting, 1997; Juslin & Olsson, 1999).

Self-assessment concerns a particular category of judgments dealing with evaluations of individuals' own abilities, performance, and skills. Self-assessments are very frequent and important in everyday life. When people chose to take certain actions (e.g., applying to advanced business schools, starting a career as a golf professional, and choosing to invest in stocks), they base their decisions on beliefs about their skills, expertise, and personality. It should be noted that this phenomenon, in a sense, relates to the overconfidence-construct of "better-than-average effect" (cf. Svenson, 1981). However, an important difference is that self-assessment does not necessarily involve comparisons to other people. Self-assessments are systematically flawed in that people overestimate their abilities (Dunning, Heath & Suls, 2005). Sometimes flawed self-assessments take the opposite direction: Participants who have been objectively classified as top-performers tend to underestimate their performance (Kruger & Dunning, 1999). Moreover, people are inclined to think they are above average when it comes to experience desirable outcomes and avoid undesirable outcomes (Dunning et al., 2005). Similarly, most people perceive that most types of risks are lower for them than for the general population (Sjöberg, 1999). However, the tendency among car drivers to believe they drive safer than average and, therefore, exposed to less risk (cf. Svenson, 1981) may not be irrational, because the distribution of accidents are, apparently, highly skewed meaning that the majority of drivers face less accidents than the average numbers of accidents (cf. Gigerenzer, 2002).

In conclusion, miscalibrated judgments and flawed self-assessment are constructs of overconfidence (and underconfidence). It seems reasonable to assume that they are related, but little seems to be known about their relationship. In essence, this concern connects to whether overconfidence is a stable cognitive phenomenon. Based on the two approaches to measure calibration, psychologists have found that research subjects, who have been deemed to be overconfident in one domain, also tend to be that in another domain (e.g., Klayman et

al., 1999; Jonsson & Allwood, 2003). A recent working paper (Glaser, Langer & Weber, 2005) reported that professionals' (interval) responses to a short confidence quiz correlated moderately with their (interval) predictions of stock prices. Thus, it appears that miscalibration is a somewhat stable individual tendency. In addition, overconfidence seems to be weakly correlated with the personality trait of extraversion (Schaefer, Williams, Goodie & Keith, 2004).

To sum up, the paper aims to explore whether the tendency to be overconfident in one domain carries over to another domain. More precisely, based on responses from students answering a simple confidence quiz and predicting their performance on an academic course, the paper applies a within-subjects design to investigate whether miscalibration also reflects tendency to make flawed self-assessments. While miscalibration is defined as the tendency to make inadequate confidence intervals, flawed self-assessment concerns the inability to accurately predict educational performance. Earlier research indicates that when people are asked to provide 90%-confidence intervals, their responses cover the correct answers between 36% and 58% of the cases (Russo & Schoemaker, 1992; Biais, Hilton, Mazuerier & Pouget, 2005). Evidence suggests that the average correlation between expected and actual educational performance is roughly around 0.21 (cf. Dunning et al., 2005). Simply put, the study addresses the question: Does the performance on a confidence quiz relate to the (in)accuracy of self-assessments concerning grades and exam scores?

METHOD

Participants

Participants were 46 (11 females) undergraduates from a Swedish business school who completed a course on behavioral-oriented finance in the fall semesters of 2003 ($n = 22$) and

2004 ($n = 24$). Mean age was 24.3 years (range 21 – 34 years). Most participants completed the course in the last year of their education.

Procedure

The participants responded to two forms at two occasions: Form A and Form B.

Form A. At the prelude of the course, a form was handed out. Besides various tasks related to the concepts of behavioral decision-making (e.g., heuristics and biases, prospect theory), this form included a confidence quiz and questions concerning expected course performance. The participants were asked to (1) state their expected performance in comparison to others, (2) estimate expected grade and their confidence in this expectation, and (3) provide a 90%-interval of expected grade.

Form B. When about five weeks of the course had passed, there was a written exam. After completing the exam, the participants were faced with four questions, which were voluntarily to answer. In order, they were asked to estimate expected exam score and confidence interval around this estimate. To promote calibration, they were told that bonus points could be awarded in case the expected score fell inside the stated confidence interval. They were also instructed to assess the expected number of bonus points as well as their chances of receiving those points.

The exam of the fall 2004 differed from that of the fall 2003 in the following ways. First, most questions were different to prevent the students of class 2004 from being helped by their peers of class 2003. Second, the class of the fall 2004 could select eight out of 14 open-ended questions while the class of the fall 2003 chose eight of 12. Third, the 20 multiple choice questions of the exam from the fall 2004 had on average 5.9 items ($SD = 1.7$) compared to 4.9 items ($SD = 1.7$) of that from the fall 2003. The latter two differences were motivated by a deliberate quest to make the exam more difficult.

Measurements

Confidence quiz. The confidence quiz by Russo & Shoemaker (1990) was used. This quiz consists of ten items (e.g., “What is the length of the river Nile?”) prompting a subject to provide ten intervals, of which he/she feels 90% sure cover the correct answers. It is assumed that calibrated individuals with insights into the limitations of their (general) knowledge should provide intervals covering nine out of ten correct answers. In contrast, if more than one interval falls outside the correct answer, he/she is said to be overconfident. Should all answers be inside the intervals, he/she is said to be underconfident.

Expected course performance in relation to peers. The participants judged their expected course performance in relation to their peers on a seven verbally anchored scale with endpoints “much worse” (1) and “much better” (7). The midpoint (4) denoted “equally good”. Assumed to reflect “better-than-average-effect”, this measurement is similar to that used by Svenson (1981).

Self-assessment of course grade. The participants judged the course grades they expected to receive. Theoretically, course grade ranged between 0 and 200, where a value below 100 meant flunk.

Confidence interval around self-assessment of course grade. The participants provided intervals, which they felt 90% sure would cover their actual course grades. Thus, they gave a lower limit and an upper limit for their expected course grades.

Actual course grade. Obviously, this measure was determined by the course teacher who lacked knowledge of the expectations of the students. As no participant flunked, this measure varied between 100 and 200.

Self-assessment of exam score. The participants estimated the scores they thought they would receive on the exam. Theoretically, the range of the exam score was 0 to 80. To encourage accuracy, the participants were told that they could receive bonus points given that

their expected exam scores fell inside a selected interval. For example, a participant could state that his/her expected score would be within 20 (2) points and if that would be the case he/she would be awarded by 2 (10) bonus points. Thus, the more narrow (wider) interval, the less (greater) number of bonus points.

Actual exam score. Obviously, the course teacher, who was uninformed about the expectations of the students, marked the exams and determined the scores.

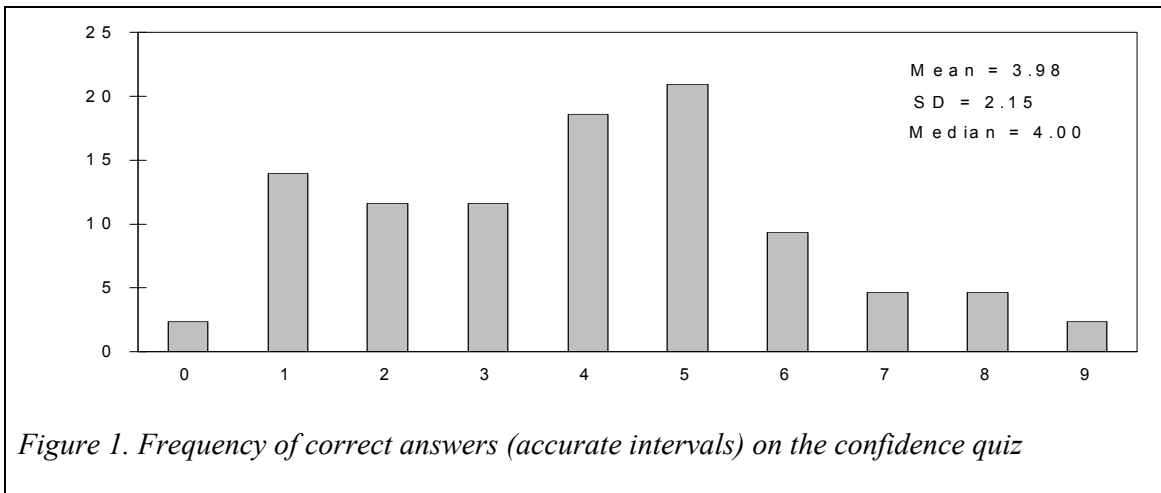
Self-assessment of awarded bonus points. The participants stated how many bonus points they expected to receive. Maximum and minimum numbers of bonus points were 10 and 0, respectively.

Actually awarded bonus points. Should the actual exam score be inside the stated interval, bonus points were awarded. Theoretically, the number of bonus points ranged between 0 and 10.

RESULTS

How well or poorly did the participants perform on the confidence quiz?

As illustrated by Figure 1, the vast majority of participants was inaccurate and produced intervals that covered between 1 and 5 correct answers. Mean proportion of correct answers inside the confidence levels was 3.98 (SD = 2.15). Excluding the three participants who gave incomplete responses, there were a total of 430 intervals of which 60% were outside the corrected answers. Only one participant managed to produce intervals covering nine out of ten correct answers. Following the terminology by Russo & Shoemaker (1990), the remaining 42 participants must be considered to be overconfident. Given that the confidence quiz permitted one miss, the level of miscalibration, which was denoted as the proportion of incorrect answers, ranged between 0.00 and 0.90 with an average of 0.50 (SD = 0.22).



For some reasons, the two classes differed with respect to their performance on the confidence quiz. On average, the classes of fall 2003 and 2004 had 4.67 and 3.32 (SDs = 2.33 and 1.78) correct intervals. This difference was shown to be significant ($t(41) = 2.14, p < 0.05$). Accordingly, the classes had different degree of miscalibration.

How well or poorly did the participants assess their own performance?

Recall that the participants made a series of self-assessments concerning expected performance. Table 1 shows that the average participant believed that he/she would perform slightly better than others, obtain the grade of 152.95 (out of 200) on the course and a score 59.70 (out of 80) on the exam. He/she also expected to be awarded with 5.70 (out of 10) bonus points by accurately judging the actual exam score. These beliefs were not too far-fetched. On average, actual course grade, actual exam scores, and actually awarded bonus points were 155.74, 60.70, and 5.17 (SDs = 19.90, 13.68, and 1.90).

Wilcoxon signed rank test indicated that the expectations were not significantly different from the actual performance. As shown by Table 2, whereas expected and actual course grades were weakly related ($r = 0.29, p < 0.10$), expected and actual exam scores correlated strongly ($r = 0.83, p < 0.001$). The correlation between judged and actually

awarded bonus points was moderate ($r = 0.40$, $p < 0.01$). In addition, an overwhelming majority (80%) provided intervals that covered their actual course grades. Those tendencies to well-calibration should, however, be viewed in light of the fact that 28 (15) participants expected to perform better than (equally good as) average, but only 16 (seven) of them did so. Nevertheless, the participants seemed to exhibit fairly good but not perfect insights into their abilities.

Table 1. Descriptive statistics concerning self-assessments (expected performance) and actual performance.

	Mean	SD	Median
Expected course performance in relation to peers ^A	4.93	0.97	5.00
Self-assessment of course grades ^B	152.95	14.68	150.00
Actual course grades	155.74	19.90	158.00
Lower limit concerning expected course grades	125.02	27.43	130.00
Upper limit concerning expected course grades	176.55	14.61	180.00
Self-assessment of exam scores ^C	59.70	11.62	60.00
Actual exam scores	60.70	13.68	63.50
Self-assessment of awarded bonus points	5.70	1.26	6.00
Actually awarded bonus points ^D	5.17	1.90	6.00

Notes:

^A Range was from 1 (“much worse”) to 7 (“much better”). 4 meant “equally good”.

^B Range was from 0 to 200, where 100 meant flunk.

^C Range was from 0 to 80.

^D Range was from 0 to 10.

There were three statistical differences between the two classes. First, the class of fall 2004 expected to be awarded with higher grades than that of fall 2003 ($M = 157.35$ vs. 148.14 , $t(42) = -2.16$, $p < 0.05$). Second, their lower limits were higher than those of the class of fall 2003 ($M = 115.62$ vs. 133.61 , $t(42) = -2.28$, $p < 0.05$). An explanation for those observations could be that the class of fall 2004 had information about the actual grades of the class 2003 and, therefore, had higher expectations. Third, the class of fall 2003 received greater exam scores than the class of fall 2004 ($M = 66.82$ vs. 55.08 , $t(44) = 3.19$, $p < 0.01$), implying that changing the contents of the exam had an effect. To control for class

differences, partial correlation analyses were run. As shown by Table 2, the results of those analyses were not too different from those of simple correlation analyses.

Table 2. Pearson's and partial correlation coefficients for the self-assessment measures.

	1	2	3	4	5	6
1. Self-assessment of course grades		<i>0.29^a</i>	<i>0.17</i>	<i>0.24</i>	<i>-0.13</i>	<i>-0.02</i>
2. Actual course grades	0.29 ^a		<i>0.56***</i>	<i>0.73***</i>	<i>0.10</i>	<i>0.22</i>
3. Self-assessments of exam scores	0.09	<i>0.54***</i>		<i>0.85***</i>	<i>-0.21</i>	<i>-0.26</i>
4. Actual exam scores	0.06	<i>0.64***</i>	<i>0.84***</i>		<i>-0.27</i>	<i>0.07</i>
5. Self-assessment of awarded bonus points	-0.12	0.10	-0.20	-0.24		<i>0.23</i>
6. Actually awarded bonus points	-0.04	0.22	-0.24	0.09	0.23	

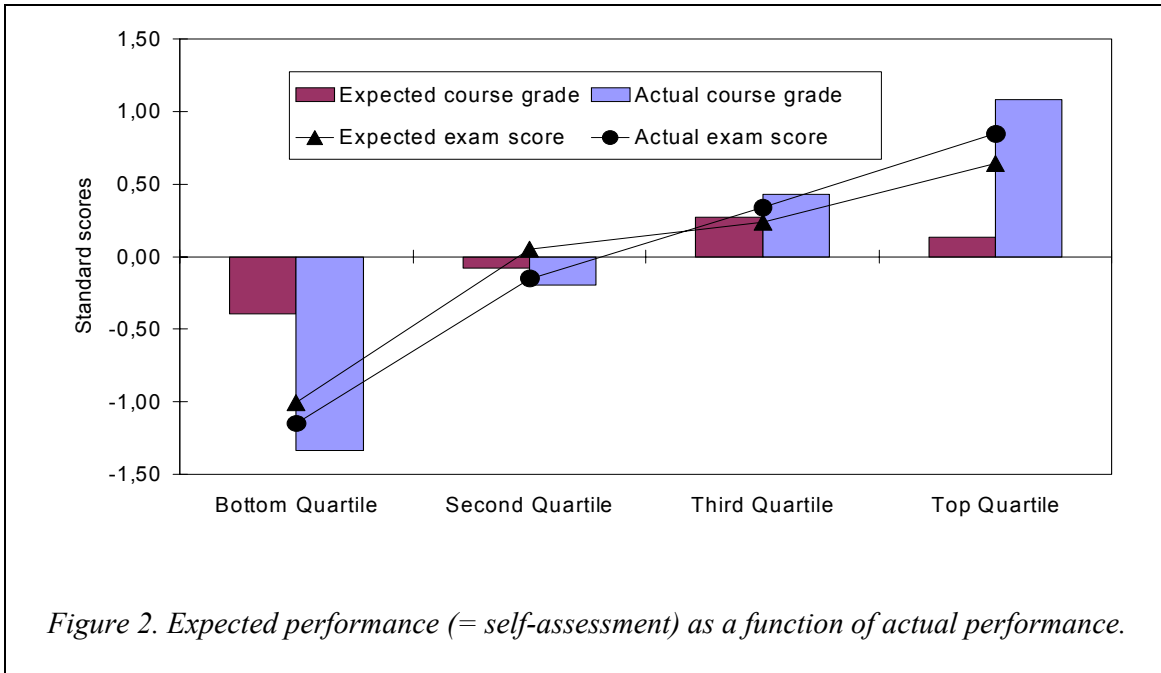
^a denotes $p = 0.06$ *** $p < 0.001$

Notes: The coefficients in italics are partial correlations controlled for the effect of the two classes.

Inspired by the procedure by Kruger & Dunning (1999), the variables concerning actual course grades as well as actual exam scores were split into quartiles.¹ Because the data concerned two different years (fall 2003 vs. fall 2004), the split was made for each year. The resulting categorization of observations was more or less identical as that of splitting the aggregated data. To facilitate comparisons, the variables denoting expected and actual course grades as well as expected and actual exam scores were transformed to standard scores.

Figure 2 shows that the participants of the bottom quartile ($n = 11$) tended to exaggerate their course grades and exam scores, whereas those of the top quartile ($n = 11$ and 12) were inclined to underestimate their true ability. Wilcoxon signed rank test indicated that the discrepancy between expected and actual course grades was significant for the bottom quartile ($Z = -2.19$, $p < 0.05$) but less substantial for the top quartile ($Z = -1.87$, $p < 0.10$).

¹ The corresponding split was not made with respect to actually awarded bonus points, because the resulting quartiles involved severely uneven number of observations.



In contrast, the discrepancies between expected and actual exam scores were found to be insignificant for the quartiles. Thus, it appears that the incentives to make accurate self-assessment reduced the aforementioned tendencies. It should, however, be noted that the same tendencies were observed but without statistical support. Regarding the discrepancy between expected and actually awarded bonus points, the bottom quartile was prone to exaggerate the number of bonus points they would receive, although no statistical support could be established.

How did the different measures of calibration and self-assessment relate to each other?

The relationships between the various measures of overconfidence were investigated by correlation analyses. Table 3 shows that most measures were unrelated except for three significant relationships. First, significant correlation was found between the variables called expected performance in relation to peers as well as discrepancy in expected and actual course grades ($r = 0.39, p < 0.01$). Second, the variables, which represented discrepancies

between expected and actual course grades as well as between expected and actual exam scores, were inter-correlated ($r = 0.33$, $p < 0.01$). Thus, participants who overestimated their course grades also tended to exaggerate their exam scores. Third, discrepancy between expected and actual exam scores was strongly correlated with discrepancy between expected and actually awarded bonus points ($r = 0.61$, $p < 0.01$). Participants, who overestimated their exam scores, were prone to overestimate the bonus points they expected to receive. To control for differences between the two classes, partial correlations were run. As shown by Table 4 the results were more or less similar at those obtained using simple correlation analyses.

Table 3. Pearson's and partial correlation coefficients of measures related to miscalibration and flawed self-assessments.

	1	2	3	4	5
1. Miscalibration defined by the confidence quiz		<i>-0.24</i>	<i>0.00</i>	<i>-0.16</i>	<i>-0.15</i>
2. Expected course performance in relation to peers	-0.17		<i>0.47**</i>	<i>-0.01</i>	<i>0.04</i>
3. Discrepancy between expected and actual course grades	0.05	<i>0.39**</i>		<i>0.29</i>	<i>0.14</i>
4. Discrepancy between expected and actual exam scores	0.03	0.08	<i>0.33*</i>		<i>0.66***</i>
5. Discrepancy between expected and actually awarded bonus points	-0.11	-0.07	0.13	<i>0.61**</i>	

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Notes: The coefficients in italics are partial correlations controlled for the effect of the two classes.

In a further attempt to investigate the relationship between miscalibration and flawed self-assessments, the following procedure was employed. Like Biais et al., (2005), the variable denoted miscalibration as defined by confidence quiz was split into quartiles. To facilitate comparisons, the remaining variables of Table 3 were transformed to standard

scores. For each quartile of the aforementioned two variables, mean values were calculated and organized in graphs. See Figure 3.

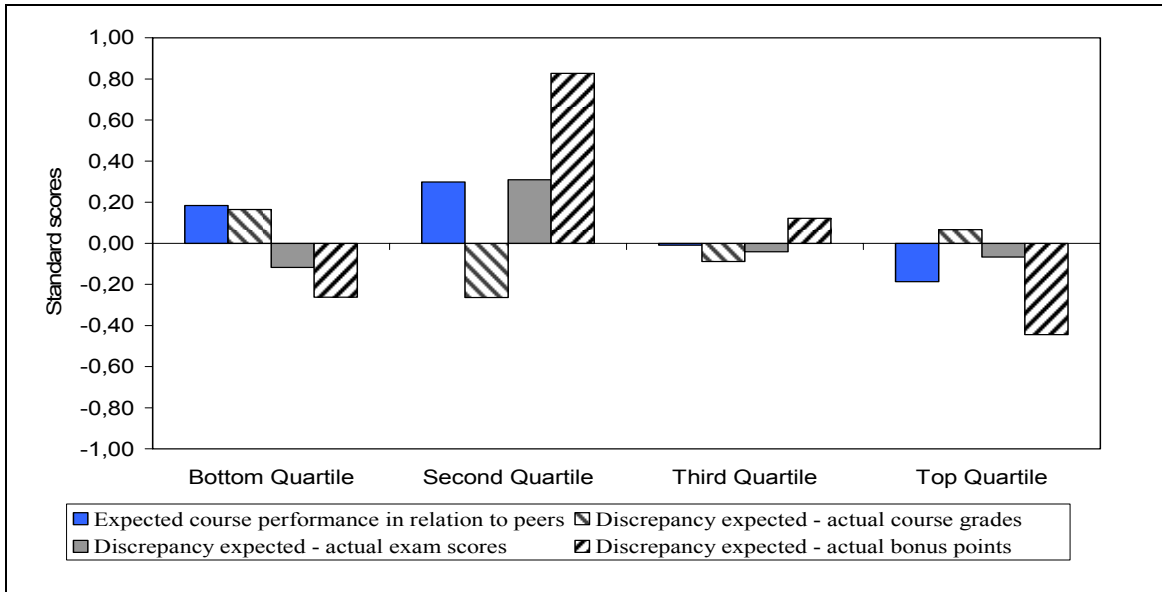


Figure 3. Expected course performance in relation to peers and discrepancies between expected and actual course grades, exam scores, and bonus points (= flawed self-assessment) as functions of miscalibration defined by the confidence quiz. The bottom and top quartiles refer to those had lowest and highest degree of miscalibration.

To test whether the quartiles differed with respect to expected course performance in relation to peers as well as discrepancies between expected and actual course performance, Kruskal-Wallis non-parametric tests were performed. As indicated by Figure 3, the second quartile differed significantly from the others with respect to discrepancy between expected and actually awarded bonus points (mean ranks = 28.11 vs. 20.00, 22.85, and 18.00, chi-square = 7.92, $p < 0.05$). Additionally, the bottom and the top quartiles, which represented the participants who had the lowest and the highest degree of miscalibration as defined by the confidence quiz, were pitted against each other. No substantial differences could be established.

Finally, the degree of miscalibration was compared between the participants who stated intervals falling outside ($n = 6$) and covering ($n = 37$) the actual course grade, respectively. In order, mean degree of miscalibration was for the two groups: 5.67 vs. 4.92 (SDs = 2.66 and 2.09). The little difference was not significant.

DISCUSSION

In summary, the study showed inconsistent judgmental tendencies of the participants. While the confidence quiz - in line with earlier research (Russo & Schoemaker, 1992; Biais et al., 2005) - indicated a tendency to overconfidence, the other measurements suggested tendencies to well-calibration and underconfidence. On average, the participants assessed their course performance fairly accurate. Meanwhile, the worst-performing participants tended to significantly overestimate their abilities, whereas the top-performing participants were inclined to underestimate; observations that harmonize with earlier research (Kruger & Dunning, 1999). Given the inconsistent judgmental tendencies, the employed measurements were, on the whole, weakly and insignificantly correlated.

In conclusion, the study hints that judgmental miscalibration (defined by a short confidence quiz) is unrelated to flawed self-assessment (regarding academic performance). In other words, the tendency to be overconfident in one domain seems not to carry over to another domain. This observation could be viewed in light of two circumstances. Firstly, the observed inconsistency of judgmental tendencies could be that the measurements are associated with different cognitive processes. For example, people have been proposed to apply so-called inside and outside views when they face different judgment situations (Kahneman & Lovallo, 1993). An inside view means to consider situations as unique and focus on details without consideration to statistics or experiences, while outside view refers to the propensity to think in terms of a large sample of situations and to make comparisons

between a current case and similar past cases (Kahneman & Lovallo, 1993). It has been argued that people apply an inside view when faced with the task to provide confidence levels as well as intervals, whereas they adopt an outside view when asked to state their expected accuracy after responding to a series of knowledge questions (Griffin & Tversky, 2002). As a result, they tend to be overconfident in the former task and calibrated in the latter task.

Secondly, it must also be taken into account that the study employed different types of measurements for miscalibration, flawed self-assessment, and related issues. The few studies that have used multiple approaches to measure overconfidence have shown incoherent or, at best, moderately correlated judgmental tendencies. For example, Kirchler & Maciejovsky (2002) asked participants taking part in an experimental market to provide subjective intervals around future prices and state their confidence (on a nine-step scale) in those intervals. They found that the former approach pointed to overconfidence, while the latter one suggested that the participants were simultaneously calibrated or underconfident. In contrast, Budescu & Du (2005) recently reported that asking participants for subjective probabilities and interval estimates, respectively, yielded more or less similar tendencies in confidence judgments. Andersson, Edman and Ekman (2005) relied on four ways to measure confidence in football forecasts: (1) confidence scales similar to those of Oskamp (1982), (2) expected accuracy, (3) difference between expected and actual accuracy, (4) self-reported forecasting ability. Although the measures were moderately intercorrelated, they gave roughly similar results. Nevertheless, the observed inconsistencies of judgment tendencies in the present paper could be partly explained by differences in measurements.

Finally, a word of caution. Using a short confidence quiz like that of the present study may not be a reliable way to determine miscalibration. Evidence from a vast body of psychological research on calibration indicated that such a quiz has methodological problems. As mentioned in the introduction, the selection of questions (tasks) could strongly influence

the observations by a short quiz. For example, merely asking ordinary people about esoteric and extraordinary tasks (e.g., “How many bolts does Ölandsbron – the bridge between the Swedish mainland and its second largest island Öland - have?”²) will likely, or perhaps always, result in overwhelming tendencies to overconfidence. As shown by the present study, the performance on a short confidence appears to be unrelated to the tendency to make flawed self-assessments. For many people, such types of appraisals are more common and important in everyday life than providing confidence levels (or intervals) for a small set of general knowledge questions.

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² A check at the webpage <http://susning.nu/%D6landsbron> showed that Ölandsbron has approximately 64.300 bolts.

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