THE STUDY OF METACOGNITION IN RELATION TO INTELLIGENCE, SELF CONCEPT AND ATTITUDE TOWARDS STUDY

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ABSTRACT

Studies of metacognition and self-concept are especially abundant in the use of this approach, despite the fact that self-evaluations are used in a wide variety of academic fields. Although there is universal consensus that there is a relationship between academic self-concept and self-evaluations as learnt via metacognitive monitoring, there is a dearth of research that investigates the intricacies of this connection. The individual-differences technique, which has taken into consideration this connection on occasion, is the subject of the current investigation, which also double-extends the method. The computation of a self-concept bias and the use of this bias in order to compare metacognition and self-concept is a novel technique that is comparable to research on metacognition. The second limitation of the study was that it was conducted with just elementary school kids as participants. When comparing the two notions with absolute confidence, the results revealed a moderate association between academic self-concept and metacognitive monitoring. This conclusion is in line with the findings of prior studies. However, when the components were connected using the appropriate biases, a more significant correlation was revealed between them. Rather than positing that the validity of self-evaluations is in jeopardy, this study casts doubt on the notion that a general confidence feature is the most appropriate explanation for the relationship between metacognition and self-concept. The current study proposes a fresh and promising way to compare and connect the constructs of metacognition and self-concept. Additionally, the study presents a method to quantify a bias in self-concept. Both of these techniques are aimed at comparing and linking the two concepts.

Keywords: Metacognition, Intelligence, Self-concept, Attitude towards

INTRODUCTION

Research on how individuals evaluate themselves may be found in a variety of professions. For example, research on metacognition and self-concept mainly relies on self-evaluations as a data collection tool. Nevertheless, for a very long time, many have believed that metacognition and self-concept are two distinct phenomena that originate from two distinct schools of thought in the field of research. As a direct result of this, there has been an absence of theoretical basis as well as collaborative study that is thorough.

The individual-differences technique is one of the few fields of study that has sometimes investigated the connection between metacognition and self-concept. This method is based on the assumption that persons have a general confidence characteristic. This body of work is a continuation of that approach. The following paragraphs provide two separate analyses and expansions of the study that is currently being conducted. A fresh and optimistic viewpoint on comparing metacognition and self-concept is one of the goals of this research, which aims to add to the current body of information by presenting a new perspective on the subject. Another factor is that previous studies were able to enrol younger people since they concentrated on first graders as their participant population. This study intends to investigate the origins of the relationship between metacognition and self-concept in children, despite the fact that the majority of prior research has focused on adults.

One definition of metacognition describes it as "any cognitive activity that controls cognitive processes as well as an individual's understanding of cognition." Metacognition is a very wide concept. As part of the control mechanisms that regulate cognition, monitoring refers to the ability to keep track of, check, and assess the effectiveness of one's own cognitive activities as they develop. This is what we mean when we speak about monitoring. This study emphasises on confidence judgements, which are an essential component of metacognitive monitoring since they reflect the degree to which a person feels that a given answer is accurate immediately after an item's response. This research's primary emphasis is on confidence judgements. Consequently, confidence evaluations are reflections of how well an individual believes they performed on a certain aspect of a cognitive task of their own choosing.

On the other hand, a person's self-concept incorporates all of the knowledge and understanding that they have about themselves, which includes their self-perceived level of ability and how they evaluate it in other domains. Different aspects of a person's self-concept, such as their social, physical, and intellectual selves, are known to be related with various domains of self-concept. This is a well-known fact. More specifically, the latter may be further classified as either a mathematical or verbal self-concept, as is the customary practice. Self-concept assessments take into account an individual's perceived performance throughout an entire domain, evaluating skills and outcomes over a broad variety of activities that are relevant to that domain. This is in contrast to confidence judgements, which are normally (or at least in principle) confined to a single item or task at a time. As an additional point of interest, confidence evaluations are done immediately after cognitive performance (that is, once the response is given), but self-concept evaluations are conducted after a considerable amount of time has passed since the cognitive performance. Therefore, self-concept is the form of self-evaluation that is more wide, expansive, long-lasting, and maybe more abstract.

Given that both academic self-concept and confidence evaluations are representations of an individual's appraisal of their own cognitive capacity, it has been believed that there are links between the two that are not trivialities. On the other hand, the precise nature of the relationship that exists between the two ideas is still mostly unclear. Research has established a connection between metacognitive monitoring and self-concept in an attempt to determine the factors that contribute to the phenomenon of overconfidence, which is particularly prevalent in youngsters. Within the realm of metacognition research, this particular line of study is derived from the individual-differences method being used. In the following, we will discuss the thought process that behind this methodology, as well as the most significant outcomes that resulted from its implementation.

OBJECTIVES

1. To Learning about Metacognition and how it relates to IQ

2. To find out how one thinks about and approaches their own education

MATERIALS AND METHODS

Procedure

This study was based on information gathered from students in Switzerland who were in the first grade. Students' arithmetic and reading abilities, as well as their academic self-concept and metacognitive monitoring capabilities, were evaluated using confidence judgements. The dataset also contained evaluations of students' ability to monitor their own learning. These examinations were carried out in the classroom by experimenters who had received training. At the same time as self-concept and monitoring were evaluated on an individual basis, academic achievement was evaluated within the framework of a classroom setting. As part of a learning project, laptops were used to conduct an evaluation of monitoring responsibilities. The use of paper and pencil was essential for administering the self-concept and achievement tests. For the purpose of the testing session, a half an hour was allowed to each individual student. Not only did the study get approval from the Ethics Committee for the Humanities at the University of Bern, but it was also carried out in accordance with the Declaration of Helsinki. The informed consent of the parents was obtained from each and every kid who took part in the study.

Participants

There were a total of 125 children from the German-speaking area of Switzerland who participated in the study. There were 71 girls and 84 males. During the time that the data was being collected, the first graders had an average age of 7 years and 6 months (standard deviation = 4.19 months).

Measures

Academic achievement

The use of age-appropriate and standardised assessments was used in order to assess the students' mathematical and reading abilities. Each of the subjects of literacy and mathematics received a score of three.

The development of mathematical skills. During the administration of the "Heidelberger Rechentest" (HRT), which was a curriculum-based and standardised examination of mathematical ability, there were three subtests that were included. All of the parts that comprised these subtests consisted of tasks involving addition and subtraction, numerical sequence continuation, and magnitude comparison (Cronbach's α =.80). The HRT has test-retest reliabilities that range from.87 to.93, depending on the individual.

The required level of literacy was achieved. For the purpose of evaluating literacy proficiency, three curriculum-based standardised tests that included fundamental reading and spelling skills were used. The "Salzburger Lese Screening" (SLS) was used in order to assess the level of reading comprehension

possessed by the pupils. They were asked to evaluate the phrases according to the meanings of the phrases. As part of the "Wurzburger Leise Lese Probe" (WLLP), pupils were asked to read a word and then swiftly match it with an accompanying picture. This was done in attempt to determine how fast they could read. For the purpose of evaluating the pupils' spelling abilities, the Hamburger Schreib-Probe (HSP) was used. In addition to completing a single statement, they were required to write the names of twenty-two visually represented things. The total value of Cronbach's α was.85 for all three tests. Based on the results of the parallel-form approach, all three tests have produced dependability values that fall within the range of 0.82 to 0.98.

Metacognitive monitoring

The evaluation of metacognitive monitoring was carried out via the use of a paired association learning task. During this activity, students were requested to learn the meaning of Japanese symbols, which are often referred to as Kanjis. Specifically, the assignment consisted of two sets of eight Kanji characters each. There was no difference in the order of administration between the two sequences. Children were required to determine the meanings of the Kanji symbols throughout the first time of fixed-length encoding as well. As a result of this, we displayed each Kanji for a period of four seconds with a colour graphic that provided an explanation of what it represented. Before beginning each trial, the participants were instructed to devote one second of their attention on a cross, which served as the attractor and was shown in the centre of the screen. Following the encoding phase, the children were given a memory recall test in which they were shown each Kanji along with four pictures that had been presented to them earlier. It was necessary for the children to choose a picture that they felt best exemplified the Kanji that they were applying to their work. Last but not least, the children were provided with a scale that was similar to the Likert scale and had smiling faces to show the degree of confidence they had in their replies for each Kanji. Prior to the examination, the children were provided with a smiling scale that varied from happy to sad. There were five different smileys included in it. Very certain, completely certain, relatively certain, and exceedingly unsure were the verbal descriptors that were linked with this phrase. For the purpose of the study, the smileys were divided into four categories, ranging from zero (very unsure) to four (absolutely confident). For the purpose of ensuring that children were able to comprehend the idea behind the smiling scale, the instructions included a story about a child who was tasked with determining which of six boxes held a ball. The use of the smiling scale was immediately apparent to the children, and they had no trouble answering the three practice questions that were given to them. The monitoring resolution, bias in confidence judgements, and absolute level of confidence judgements were the three metrics that were used in the analysis.

The extent to which one relies completely on evaluations. For the purpose of determining the absolute degree of confidence assessments, the mean of all confidence judgements was used as a measure, with Cronbach's α equal to 80 percent. Depending on the circumstances, judicial evaluations of certainty might have an absolute value anywhere from zero (very unsure) to four (extremely definite).

Maintaining a close watch on the final product. A discrimination score was determined by subtracting the mean confidence judgement for incorrect trials from the mean confidence judgement for correct trials. This resulted in the value of the discrimination score. Because of this, we were able to make an assessment on the monitoring's relative accuracy. It is important to keep in mind that in order to determine resolution, the memory recall test had to include children who had made at least one error, which

accounted for 77% of the sample. Depending on the monitoring resolution, it may be anywhere from -4 (no discrimination) to +4 (full discrimination), or it might be anywhere in between.

There is bias in the monitoring. The introduction of the monitoring bias was done with the intention of determining the extent to which confidence evaluations about performance were either too confident or underly confident overall. It was determined that the bias was characterised as the significant divergence between the confidence judgement and the memory recall performance, which was evaluated based on the degree of accuracy or incorrectness of the Kanji recognition. In the event of accurate recognition, the most suitable confidence judgement, "very sure," produced a discrepancy of zero; "sure" brought about a negative discrepancy of -1, suggesting underestimation of performance; "neither sure nor unsure" produced a discrepancy of -2; "unsure" produced a discrepancy of -3; and "very unsure" produced a discrepancy of -4. When it comes to incorrect recognition, on the other hand, the confidence judgements "very unsure" (which was the most appropriate) produced a discrepancy of zero, "unsure" produced a positive discrepancy of one, "neither sure nor unsure" produced a discrepancy of two, "sure" produced a discrepancy of three, and "very sure" produced a discrepancy of four. We calculated the average difference between all sixteen questions and applied it to each participant as a method of determining whether or not there was bias in the monitoring process. If the monitoring bias is near to zero, it indicates that the self-evaluations are accurate; if it is not close to zero, it might be anywhere from -4 to +2, depending on the circumstances.

Self-concept

We examined academic self-concept by using the Pictorial Self-Concept of Attainment Scale (PSCAS), which consists of three items for each of the mathematical and verbal components of self-concept pertaining to academic achievement. The PSCAS components were all organised in a vertical row of twenty-five stick figures, which is comparable to the size of a normal primary school classroom. This arrangement was done in order to maximise the learning experience. The students were instructed that the stickman sitting at the top of each item indicated the student who had the highest level of performance in the class, while the stickman sitting at the bottom of each item represented the student who had the lowest level of performance. It was requested of the pupils that they choose the stick figure that best represented their position within the class. The students were required to think that their classmates were coming together to create a line depending on their relative body height in order to finish a practice item. This was done for the goal of determining whether or not they had understood the material. The students had no trouble understanding the idea behind the scale and how it should be used. Evaluations of academic self-concept bias and absolute level were used in the research investigations.

A complete and total degree of self-concept. The absolute degree of academic self-concept was determined by calculating the mean of the absolute mathematical and verbal self-concepts. Cronbach's α was estimated to be 0.79 for each of the six questions within the study. An absolute degree of self-concept may be measured using a confidence scale that ranges from 1 (very low) to 25 (extremely high). This scale is used to measure bias towards one's own self-perception. The identification of academic self-concept bias was accomplished by the identification of discordance between domain-specific self-concepts (for example, verbal and mathematical self-concepts) and academic achievement scores in relation to those domains. Therefore, in order to give objective measures of performance to support the self-concept, each of the six academic accomplishment measures was rescaled to a 25-point scale. This

was done in order to provide support for the self-concept. The self-concept measures and the accomplishment measures were placed on the same scale length as a result of this circumstance. We used a method that was quite similar to the one that was described for calculating the monitoring bias in order to compute the discrepancies between academic performance and self-concept ratings and then average them across all of the different categories of self-concept. A bias score that is near to zero would suggest that the self-concept is correct and realistic, while a number that falls between -24 and +24 would indicate that the self-concept is overestimated.

Results

Descriptive statistics

The descriptive statistics on self-concept and confidence judgement measures can be found in Table 1, and the histograms can be found in Section S2. A recall accuracy of 79% (standard deviation =.20) was achieved during the course of the Kanji exercise, with an average of 13 items being correctly remembered. In terms of academic achievement, the mean score was M = 12.13 (standard deviation = 3.56), and it was rescaled to a 25-point scale because of what was said before. It was shown that there was a strong correlation between academic achievement and memory accuracy (r =.40, p <.001). Each and every one of the reported associations is included in the S1 Table.

Table 1. Descriptive statistics

	M	SD	Min	Max
Absolute level of confidence judgments	3.23	.68	1.19	4.00
Monitoring resolution	-0.13	.97	-3.34	3.87
Monitoring bias	0.20	.79	-1.37	2.69
Absolute level of self-concept	19.63	3.95	5.17	25.00
Self-concept bias	7.50	4.19	-2.31	20.45

Realism, confidence, and overconfidence

The findings demonstrated that children had, at least in principle, achieved mastery of the ability to critically evaluate their own performance. A significant correlation (r =.241, p <.05) was found between the conclusions drawn from the Kanji exercise and the confidence ratings made by the young individuals. Similar to the correlation coefficients found in the mathematical domain (r =.343, p <.001) and the verbal domain (r =.385, p <.001), it was found that there was a significant association between self-concept and academic achievement in each domain. When taken as a whole, these data indicate that children begin to engage in real self-evaluation from a young age.

The data, on the other hand, revealed a significant tendency for exaggeration to occur simultaneously. A significant disparity was seen between the absolute levels of confidence judgements and academic self-concept. The level of confidence judgements was found to be 22.692, while the level of academic self-

concept was found to be 20.904 (p <.001). In the same way that there was a glaring absence of relative monitoring accuracy, there was also a discernible absence of resolution in the monitoring. A statistically significant discrepancy was found between the monitoring resolution of children and the ideal resolution, as determined by a one-sample T-test (t(119) = -46.496, p <.001). Last but not least, the monitoring bias and the self-concept bias were both bigger than zero, which indicates that young people have a tendency to have an exaggerated sense of self-confidence and monitoring skills. One-sample T-tests were conducted against the value of complete absolute accuracy, and the results showed that both constructs had self-evaluations that were excessively optimistic. The confidence assessments had a t-value of 3.125, with a p-value of less than 0.05, and the self-concept had a t-value of 22.265, with a p-value of less than 0.001.

It was required to adapt the bias and absolute level of confidence assessments to the same scale length as the related self-concept measures in order to compare the levels of confidence and overconfidence in monitoring and self-concept, respectively. This was done in order to ensure that the comparisons presented were accurate. In order to take into consideration the fact that the scale ranges of the two independent sets of measurements were distinct from one another, this was done. A paired sample T-test revealed that there was no statistically significant difference between the absolute levels of self-concept and confidence evaluations (t(154) = -1.885, p =.061). This revealed that there was no difference between the two. When examining the self-concept bias with the monitoring bias, a paired sample T-test indicated that the self-concept bias was significantly higher than the monitoring bias (t(154) = 15.949, p <.001). This was the case when the bias in monitoring was included. The notion of self-concept is more evident than the concept of self-confidence, despite the fact that the absolute quantity of confidence seems to express on a similar level. Overconfidence appears to be inherent in both formulations.

Three types of relation between monitoring and self-concept

There were three bivariate correlations that were computed in order to determine the extent to which various monitoring metrics were connected to self-concept. To begin, there was a link between the monitoring resolution and the absolute degree of self-concept (as assessed by the metrics that are considered to be state-of-the-art in each area of research). Fig. 1A shows that there was a positive association between resolution and absolute self-concept level, but the relationship was not very strong. According to the findings of this study, self-concept and metacognitive monitoring (as evaluated by monitoring resolution) are two distinct things.
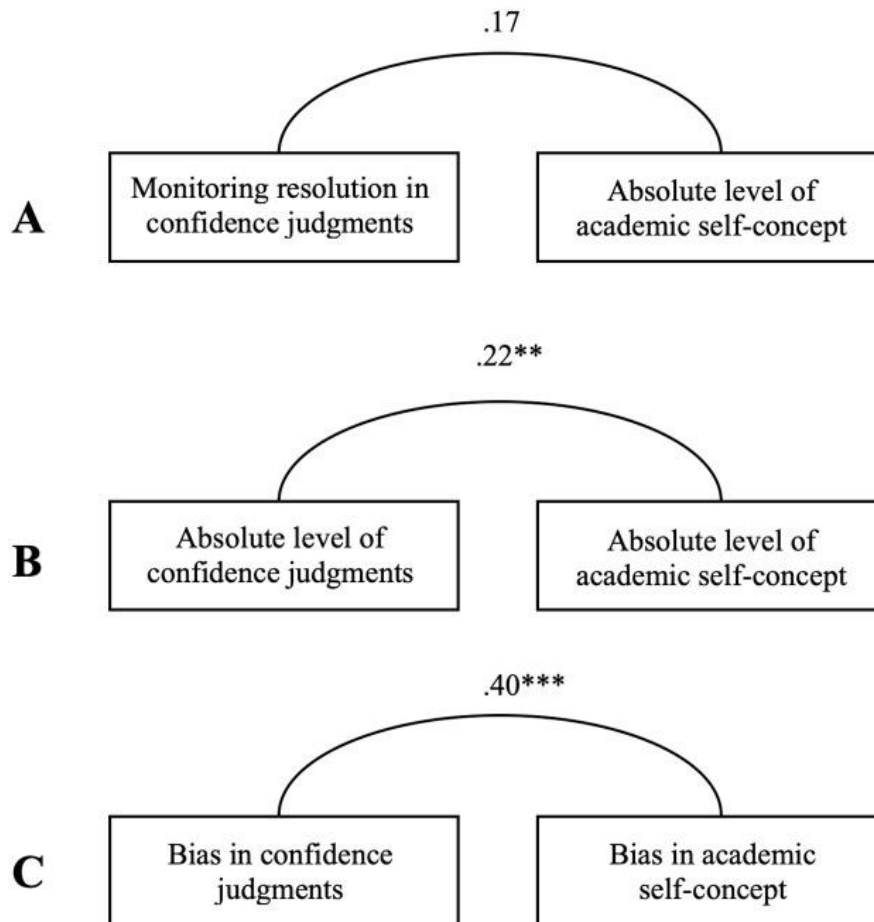
Fig 1. Relations between various measures of confidence judgments and self-concept

There are many connections between monitoring resolution, confidence assessments, monitoring bias, and academic self-concept. Here are some of those connections: The letters A, B, and C stand for monitoring resolution, confidence assessments, and academic self-concept bias, respectively. (**) = p <.01 and (***) = p <.001 are the significance values that have been determined.

The next thing that was found was that there was a connection between an individual's academic self-concept and their absolute degree of confidence judgements. Both of these things indicate the subjective sensation of achievement in a certain activity or topic independent of actual performance. There was a slight but statistically significant positive association between these absolute levels of self-evaluation, as shown in Figure 1B. People who claim to have a high level of self-assurance often have a positive view of themselves in terms of their academic pursuits.

The prejudice in confidence evaluations was tied to the bias in academic self-concept, which was linked to the prejudice. The results shown in Figure 1C demonstrate that there was a significant connection between these two biases, which was much greater than the correlation that existed between the absolute levels of self-evaluation. In other words, individuals who have fewer biassed self-concepts are more likely to generate confidence assessments that are also less biassed.

DISCUSSION

Since an individual's evaluation of themselves serves as the basis for both metacognition and self-concept, the purpose of this study was to provide a deeper understanding of the relationship between the two concepts. Prior research has only occasionally addressed the idea of a relationship between metacognition and self-concept, such as a common cognitive process of self-evaluation or a shared tendency towards biassed self-appraisals. This observation is despite the fact that there is some early evidence for the likelihood of such a connection. There is a lack of comprehensive recognition of the nature of the alleged connection, particularly with regard to children. In addition, the few studies that sought to find a common pattern of self-evaluation in metacognition and self-concept often overlooked performance in favour of evaluating absolute levels of self-confidence. This was the case in the majority of the studies. In order to expand the results of prior research, the present study attempted to combine performance metrics into confidence evaluations and self-concept in children who were in the first grade. Examples of performance measurements include assessing the accuracy of recollection or the capacity to do domain-specific tasks. In the next step, an empirical comparison was made between the concepts of metacognition and self-concept.

They were overconfident in their monitoring skills and their academic self-concept, with the latter demonstrating a far more evident bias than the former did when it came to the reliability of their own judgements. Children were overconfident in their ability to monitor themselves. According to the intercorrelations between the results of the same test, it was discovered that the measures of self-evaluation had a significant connection to the measures of performance. To put it another way, the accuracy with which one could recall Kanji was significantly tied to one's confidence assessments, whilst the success one had in mathematics and literacy were respectively associated with one's mathematical and linguistic self-constructions. As a result of the clear tendency for youngsters to be overconfident, it follows that the subjective self-evaluations that children have of themselves do, to some degree, reflect their real performance. When attempting to disentangle the connections that exist between metacognition and self-concept, it is reasonable to take into consideration the actuality of self-evaluations' existence.

CONCLUSION

The current study contributes to the existing body of research by examining the common ground that exists between metacognition and self-concept. This is accomplished by identifying and comparing a comprehensive set of construct-related measures in elementary school pupils. According to the findings, the selected measures have a significant role in determining whether or not there is a mutually supported and evidence-based link between self-concept and metacognitive monitoring. The results of domain-unifying studies will show that there is a clear overlap between the constructs; nevertheless, the scores from the relevant study field may lead to correlations that are weak and not significant. The present study suggests that the merging of self-evaluations from metacognition and self-concept is likely to be most visible when it comes to children's ability to accurately evaluate themselves. This will be the case according to the findings of the research. As a result, we arrive to the conclusion that the "real" relationship between metacognition and self-concept may be best characterised by an individual's tendency to be overconfident, and by extension, their ability to make accurate assessments of themselves.

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