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Metacognition and Personality

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Abstract

Previous research has found there are individual differences in executive functioning. Executive functioning includes metacognition, self-awareness, and metacomprehension. Previous studies have focused on personality traits and levels of executive functioning. This study seeks to determine if there is any relation between specific personality traits and metacognitive awareness. Participants in this study completed a *Metacognitive Awareness Inventory, the Big 5 Personality Inventory,* and a reading comprehension task. The results indicated that there is a positive correlation between certain personality traits and aspects of metacognition. The results also suggested that there is a relationship between agreeableness and absolute accuracy on the reading comprehension task.

1. Introduction

Metacognition refers to an individual's thoughts about knowledge, or their knowledge about knowledge. There are several aspects of metacognition, including metacognitive awareness. Metacognitive awareness is one's recognition of the learning process and what it takes to achieve good results in a specific learning context [5]. An individual who has a high self-awareness is able to monitor their experience during the learning process, actively working to monitor their understanding of the material. Research on executive functioning and metacognitive awareness has found that there are individual differences in these domains.

Personality is an area in which such individual differences exist. Personality, as defined by Funder, refers to characteristic patterns of thought, emotion, and behavior, together with the psychological mechanisms behind those patterns [4]. Previous studies have sought to determine if there is a relationship between certain personality traits, such as conscientiousness, extroversion, and agreeableness, and metacognition. Lin-Agler, et al. found that students who were highly competitive gave higher self-assessments of metacognition than less competitive students [7]. The more competitive students were also more likely to use the feedback they were given from earlier tests to change their metacognitive self-judgments. Chen and Hung had similar findings. Their study found significant relationships between learning strategies and a student's preference for introversion or extroversion based on the Myers Briggs personality test [2]. Students also showed different use of metacognitive learning strategies based on their preference for introversion or extroversion. Both of these studies show a relationship between personality and learning patterns related to metacognition.

Dai and Bidjerano found a relationship between the *Big-Five* personality model and self-regulated learning strategies in college students in Taiwan who were learning English as a second language [1]. Their findings suggest that personality traits make an independent contribution to a student's GPA, based on the use of self-regulation strategies. This study suggests that a student's personality traits, in particular conscientiousness and agreeableness, are related to metacognitive self-regulation. A study conducted by Darabad also focused on students learning English as a second language [3]. Students in the control group were given instruction on metacognitive strategies over a period of eight weeks. Extroverts and introverts showed different levels of success based on these strategies, suggesting that introverts and extroverts use different types of metacognitive strategies to be successful.

In addition, Linderholm and Zhao conducted a study to determine the absolute accuracy of individual's metacognition. Absolute accuracy is defined as the difference between estimated and actual reading comprehension test performance. In this study, participants first read two readings passages, they then were asked to estimate their comprehension of the texts both immediately and after a delay. Participants then were asked to complete a comprehension test, which was followed by a postdiction of their performance and a working memory task. The researchers correlated the participant's levels of accuracy with their working memory capacity [8].

These studies suggest a relationship between personality and metacognition on an individual level. While these studies show that a relationship exists, there is little research on how specific personality traits interact with metacognitive awareness. Understanding the relationship between these traits and metacognition can provide insight into how metacognition and personality interact, and how individual differences affect an individual's learning experience. The Linderholm and Zhao study suggests that an individual's predictions of performance and comprehension could differ from their actual performance, which is likely to be linked to personality as well.

2. Methods

2.1 Participants

At a small southeastern university, 26 undergraduate students participated for class credit or extra credit. Out of the group, eighteen were female, seven were male and one did not report gender. Seventeen students were psychology majors, while eight were not. There were three freshmen, two sophomores, five juniors, fifteen seniors and one did not report class ranking. All of the participants reported being Caucasian. Seventeen participants reported being in the 18-24 age range, seven reported being in the 25-32 age range, one reported being over 32 and one did not report age.

2.2 Materials

This study included three different instruments. Participants first completed the Big Five Inventory (BFI) [6]. The BFI consists of 44 items in which participants rate each item on a Likert-type scale from 1-5, one being strongly disagree and five being strongly agree. The 44 items measure five personality traits: openness, conscientiousness, extraversion, agreeableness, and neuroticism. Next, the participants completed the *Metacognitive Awareness Inventory* (MAI) [9].This is a self-reflective questionnaire consisting of 52 questions. Participants answered either true or false to each question. The 52 questions measure eight different types of metacognitive awareness; furthermore, the eight subscales are combined into two greater categories, knowledge of comprehension and regulation of comprehension. The amount of "True" responses were totaled for each subscale as well as the greater categories. The last component of the study was a reading comprehension task. Participants read two short non-fiction passages. The passages were at a 5.6 and 6.6 Flesch-Kincaid Reading Level, which means the passages are at the 5^{th} and 6^{th} grade reading levels. After reading the passages, participants were asked to predict their ability to answer multiple-choice comprehension questions based on the information in the passages. They were then asked to answer five comprehension questions per passage. After completing the questions, participants were asked to postdict their success on the multiple-choice comprehension questions.

2.3 Ratings

Participants predicted their performance on the multiple-choice comprehension questions by responding to the question, "Out of five, how many questions do you think you will be able to answer correctly?" They rated their perceived ability on a scale from one (Unable to answer any items correctly) to five (Able to answer all items correctly). Participants postdicted their performance by responding to the question, "Out of five, how many questions do you think you may have answered correctly?" They rated their perceived ability using the same scale.
To calculate absolute accuracy for prediction, the actual amount of items answered correctly was subtracted from the prediction scores. To calculate absolute accuracy for postdiction, the actual amount of items answered correctly was subtracted from postdiction scores. The prediction and postdiction scores for each passage were then averaged.

2.4 Procedure

Participants were recruited from psychology classes. The average time needed to complete this study was 25 minutes. When the participants arrived they were handed a consent form to review and sign. Once the consent form was completed the participants were given the Big Five Inventory. The BFI took approximately 5-7 minutes. Once the BFI was finished the participants were then given the Metacognitive Awareness Inventory. The MAI took approximately five minutes. Once this was completed the participants were given two readings to begin the reading comprehension aspect of the study. After they finished reading the two passages, the readings were collected and participants were given the self-reflective questionnaire and multiple choice tests to complete. The self-reflective questionnaire asked their prediction on the multiple choice test and their postdictions as well. Lastly, the participants completed a demographics form.

3. Results

The primary interest of this study was the relationship between personality traits and metacognition. The relationship between metacognitive awareness and absolute accuracy was also of interest. Correlations were computed in order to examine the relationships between personality and metacognition. Results indicated several notable correlations between personality traits and the eight subsets of the Metacognitive Awareness Inventory. Conscientiousness was positively correlated with Knowledge about Planning (r=.479, $p<.05$). Neuroticism was negatively correlated with Information Management (r=-.544, $p<.01$). Agreeableness (r=.533, $p<.01$) and Openness (r=.469, $p<.05$) were both positively correlated with Common Knowledge. Extraversion was positively correlated with Debugging (r=.528, $p<.01$). Within the metacognitive awareness inventory, Declarative Knowledge was positively correlated with Procedural Knowledge (r=.472, $p<.05$). Also, within the BFI, Agreeableness was negatively correlated with Neuroticism (r=-.421, $p<.05$).

Within the MAI, the eight subscales can be grouped into two larger subgroups, Knowledge about Cognition and Regulation of Cognition. Correlations were computed between personality traits and the 2 larger subgroups of the Metacognitive Awareness Inventory. Regulation of Cognition was positively correlated with Openness (r=.485, $p<.01$) and Agreeableness (r=.530, $p<.01$). There were no significant correlations between personality traits and Knowledge of Cognition. There were several significant correlations between absolute accuracy and personality traits. Agreeableness and prediction accuracy were positively correlated (r=.410, $p<.05$). Postdiction accuracy was positively correlated with conscientiousness (r=.428, $p<.05$).

An analysis of variance (ANOVA) was performed to examine if participants differed in personality characteristics due to being an overpredictior or an underpredictior on the reading comprehension task. The results indicated that there were no differences between over and under predictors on any of the five traits. However, differences on agreeableness approached significance. Hence, another ANOVA was performed with the accurate group removed, and comparing only the over and under predictors. These results indicated a marginal significance, $F(1,16)=3.222$ $p<.1$. The mean for the overpredictors was 4.13 (SD=.58) and for the underpredictors 3.57 (SD=.75).

4. Conclusions

Previous research has looked into relationships between personality traits and executive functioning. This research sought to determine if there is a relationship between specific personality traits and metacognition. This study also looked at the relationship between personality and absolute accuracy. The results of this study suggest that some personality traits correlate with aspects of metacognitive awareness. Specifically, agreeableness was found to positively correlate with common knowledge and regulation of knowledge. Conscientiousness was positively correlated with knowledge about planning. Openness was positively correlated with common knowledge. Neuroticism was found to be negatively correlated with agreeableness and information management. Finally, extraversion was positively correlated with debugging.

When looking at absolute accuracy and personality, the results suggest that there is a positive correlation between agreeableness and prediction accuracy. In addition, conscientiousness was found to be positively correlated with postdiction accuracy. These results suggest that individuals who have higher levels of agreeableness, openness, extraversion, and conscientiousness may have higher levels of metacognitive awareness. The results also suggest

that Individuals with higher levels of neuroticism have lower levels of metacognitive awareness. The results from the ANOVA suggest that there is not a significant difference between underpredictors and overpredictors in relation to personality. Agreeableness was the only personality trait where a marginal difference was present.

Based on the characteristics presented in the Big Five Inventory, (BFI) some speculations may be made as to why certain personality traits are linked to metacognitive awareness. The BFI describes the trait of openness to experience as curious, imaginative and having wide interests. An individual who scores higher in the openness to experience trait may show greater interest in their metacognitive abilities and show more curiosity in terms of how they learn. These interests could explain the relationship between aspects of metacognitive awareness and openness to experience. In terms of conscientiousness, the BFI characterizes this trait as efficient, organized and thorough. An individual who scores higher in conscientiousness might have greater metacognitive awareness due to the desire to be attentive to learning processes so as to organize and be an efficient learner. As for the personality trait of extraversion, the BFI portrays this trait as being assertive, energetic and enthusiastic. Those who score higher in extraversion may be more assertive about understanding their learning strategies and energetic about employing strategies that are productive, therefore explaining the relationship between extraversion and aspects of metacognition. Finally, the personality trait of neuroticism is characterized by anxiety, self-consciousness and vulnerability. Those who score higher in the neuroticism trait could be showing anxiety and self-consciousness about how they learn rather than being interested in regulating their learning, thus explaining why metacognitive awareness was not linked to neuroticism.

5. Limitations

One of the major limitations of this study was the limited sample size. Drawing from a larger sample could have produced greater variance and more significant results. Drawing from a more diverse sample also could have given more generalizable results. Due to the limited nature of the Big Five Inventory, an in depth analysis of the individual's personality traits was not possible. Using a more extensive personality measure could have given a more detailed profile of the individual's personality. A more detailed profile could have improved the accuracy of the results of the Big Five inventory. Likewise the Metacognitive Awareness Inventory was limited in its scope. There was not a significant correlation between the subsets of the MAI, which calls into question the validity of the instrument. A more valid and reliable instrument may have better tested the individual's true metacognitive awareness. Finally, a more challenging and more in detailed reading comprehension task may have yielded better results. Taking these improvements into consideration, future research may yield more results.

6. Works Cited

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