Personality Traits' Influence on SSRL in a Collaborative Task

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Abstract

Current research has dealt with the importance of socially shared regulation of learning (SSRL) in successful collaborative learning. So far, less is known about how individual differences influence the regulatory process of SSRL.

This research aimed to investigate how individual differences, specifically the personality traits of extraversion, agreeableness, and conscientiousness, influence SSRL during a digital collaborative problem-solving task. This study aims to expand research on the impact of individual differences on SSRL among university students, as these effects have not been thoroughly examined so far. Seven groups of three students took part in this study, wherein they completed a personality test and subsequently participated in a computerized collaborative problem-solving exercise in groups of three, in which behaviors related to SSRL were coded. Results showed that the three personality traits did not significantly predict SSRL scores, according to multiple linear regression analysis. Similarly, correlational analyses revealed no statistically significant relationships between SSRL and personality. However, on the subscales of SSRL, statistical significance was measured. As extraversion positively predicted the subcategory of SSRL, metacognition, and agreeableness and conscientiousness both have a significant relationship predicting behavior, another subcategory of SSRL. Limitations of this study included a small sample size as well as limited interactivity in the digital problem-solving task. Future research should explore these and other personality traits with a larger sample in order to better understand the underlying factors behind SSRL as well as further explore group-regulatory processes.

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Introduction

Humans have always been an innately social species, dependent on each other's knowledge and skill set to thrive (Boyd et al., 2011). Therefore, being in groups belongs to the human experience as much as eating daily. Engaging in meaningful social relationships provides a sense of connection, purpose, and support. This need for social interaction highlights the fundamental role in human well-being, impacting both mental and physical health (Umberson & Montez, 2010).

Humans do not merely live in groups; they also work within them. Collaboration with others extends beyond school projects and remains an essential part of life well into old age. Nevertheless, in, for instance, the university context, group work and collaboration between individuals is a central aspect of the academic process and career. Students, therefore, frequently engage with each other, learning and working together, which makes it relevant to investigate collaborative learning (Johnson et al., 2014).

Meaningful and enduring learning takes place through personal, active involvement, with engaged students actively participating in collaborative learning. Therefore, collaborative learning is an advantage to active students, as opposed to individual learning via lectures or large group discussions. Active students can be defined as students who intentionally participate and engage in the learning process by interacting with materials and their peers, as well as reflecting on their learning (Prince, 2004). However, well-designed collaborative learning can be beneficial for all students, as ideally, active students might influence quieter and more reserved students to participate more actively in a group environment. As well as having pre-assigned roles in groups (e.g., timekeeper, summarizer) to ensure equal participation and shared responsibility, this improves the overall academic outcome (Slavin, 1996). Collaborative learning not only positively affects the academic level but also teaches students valuable interpersonal and teamwork skills, which they can apply

later in their lives. Listening attentively, thinking critically, contributing constructively, and collaborating effectively to solve common challenges are crucial aspects of education in modern society (Barkley et al., 2004). In a university setting, there are multiple different ways in which collaborative learning is utilized, for example, the flipped classroom, debates, or group projects, to name a few. It engages students in solving complex, real-world problems, which in turn enhances understanding and retention. Problem-based learning also helps students be more independent as well as more effective in their self-regulation (Hmelo-Silver, 2004).

Having diverse groups can further enhance collaborative learning as each student brings a unique set of skills, with which, together as a group, they are able to work more efficiently. Building a diverse group with a diverse mix of skill sets and expertise can enhance problem-solving skills (Patel et al.2011), as multiple individuals contribute with different ideas and problem-solving techniques, which can enhance outcomes. However, having a diverse group can also lead to conflict in various domains like cognitive, motivational, and socioemotional, making it harder to complete a problem-solving task effectively. Conflicts in the cognitive aspects can stem from individuals not being able to understand one another's lines of reasoning. Motivational problems may originate from students' differing goals and expectations. And socioemotional problems can be described as dysfunctional communication (Hogenkamp et al., 2021). As individuals with different personality traits also have their unique skill sets and expertise, being able to work with one another despite ones differences is a crucial aspect of collaboration. In effective collaborationindividuals recognize each other's unique skills and adapt their communication and working styles in order for everyone to contribute. If this is not the case, groups may run into conflict and misunderstand each other, leading to less-effective problem solving.

The process of socially shared regulation of learning (SSRL) is a skill in used to foster good collaboration, as it seems to play an important role in achieving set group goals efficiently, by producing shared regulation of group-regulatory processes, like motivation, behavior, etc, in order to produce the best possible outcome. SSRL refers to the processes in which a group jointly regulates their collective learning activities by collectively setting goals, monitoring progress, planning strategies, motivating, and reflecting on the outcomes of their shared work (Järvelä & Hadwin, 2013).

It can be distinguished from self-regulatory skills in that it focuses not only on the task-related aspects of collaboration but also on social aspects like motivation and behavior (Hogenkamp et al., 2021). SSRL originally stems from social learning discussions and research on self-regulatory processes (Hadwin et al., 2011). In SSRL, regulatory processes are said to be shared with the group to reach a common goal. It is said to occur when group members plan, monitor, and regulate their learning in a joint effort.

SSRL consists of four categories that should be collectively regulated: metacognition, cognition, behavior, and motivation (Hogenkamp et al., 2021). Metacognition involves shared monitoring, evaluation, and planning of learning in a group. It enables learners to share the regulation process in their learning by setting goals, monitoring progress, and adapting strategies together. This can be achieved by observing the interaction between individuals and listening for cues that foster metacognition in their dialogue. It is measured, in research studies, by investigating task planning, evaluation, planning, and group planning (Hadwin et al., 2011).

Cognition refers to a group's techniques to build common knowledge and beliefs. It is measured by looking at the problem-solving strategies and verifying them. Cognition is typically observed through the student's engagement in problem-solving, as well as how they

articulate their reasoning and build on each other's ideas to arrive at joint conclusions (Roschelle & Teasley, 1995).

Behavior involves managing the actions of group members to promote shared knowledge. It consists of the regulation of positive and negative social interactions. It is measured by observing group interactions like turn-taking, helping each other, stimulating task focus, and conflict regulation. It can be achieved by setting up designated roles in a group, prompting peers when task focus is lost to engage as well as negotiating participation by, for example, inviting quiet members to speak as well as addressing and resolving conflict constructively (Hogenkamp et al., 2021).

Motivation refers to how group members jointly manage their motivation and emotional investment in a task to sustain engagement and goal-directed effort. It is believed that the higher the motivation, the better a group will perform. As stated in an article by Schunk (2005), motivation interacts with all three of the other categories affecting self-regulation. As this is a key factor in self-regulation, it can also be presumed that it plays an important role in SSRL. This is because in order to foster motivation at the group level, it first needs to take place at an individual level; only then can it be collectively directed towards shared group goals. It investigates task motivation (Schunk, 2005). This process can also be measured using observational coding through motivational talk, like encouragement or praising (Järvenoja & Järvelä, 2009).

SSRL is important for collaborative problem-solving because it tries to minimize the conflict that can happen in groups due to not being appropriately regulated, establishing problems in cognitive, motivational, and socioemotional aspects of group work, by creating an environment where these regulatory processes are shared at the group level to diminish discrepancies in the group work and ultimately have a better group outcome (Hogenkamp et al., 2021). Furthermore, in SSRL, discussing different opinions and coming to a common

solution is essential for an effective collaborative process, as can be found in the metacognitive aspect of SSRL (Hadwin et al., 2011). It is especially important for groups with different personalities, as groups composed of complementary personality traits can help SSRL to flourish, as regulatory processes are driven intrinsically, which results in more proactive involvement as well as better communication and goal setting, and increased cooperation (McCrae, 1997).

What is still unknown is why groups differ in how much SSRL they show (Hogenkamp et al., 2021). To further investigate this, it is important to look at the individual differences of each person in a group.

One of these individual differences to investigate is the personality traits each individual exhibits, which can influence SSRL and, ultimately, efficient collaborative work. According to the Big Five model, personality traits can be categorized into five trait domains, namely agreeableness, extraversion, conscientiousness, openness to experience, and neuroticism. It is said that each individual exhibits, at least to some extent, each of these traits (John, 1999).

People high in agreeableness are generally polite and cooperative; they are said to be good problem solvers and follow the guidelines of a task presented to them accordingly (Graziano & Eisenberg, 1997). Since individuals with an agreeable tendency tend to like social interactions, they are said to have a more active role in group work. People scoring high on extraversion are sociable, confident, optimistic, and enthusiastic. They also flourish in social interactions and can contribute to a positive group climate, which has also been proven to be of advantage in group motivation and commitment. Conscientious people are ordered, task-focused, and trustworthy, thereby contributing to efficient group work. People high in openness to experience usually have a wide range of interests, high levels of creativity, and intellectual interest; they regard setbacks and failures as challenges on which

they grow and can flourish. Lastly, people scoring high in neuroticism lack emotional resilience and have difficulty adapting to changes in their environment (Soto et al., 2022).

From previous research within a collaborative flipped classroom design where students worked in a group toward a common goal but regulated their learning, it can be inferred that the personality traits extraversion, agreeableness, and conscientiousness were beneficial when it came to effective collaborative group work. Extraversion is said to enhance active social interactions, influencing the motivation and task engagement of the group (Durak, 2022). Agreeableness is said to be important when it comes to sportsmanship and social functioning within a group, as people high in agreeableness are cooperative and polite. It is also positively correlated with the level of personal involvement, as their social orientation likely increases their motivation to engage more fully in group activities, as well as to avoid disruption in the group (Forrester et al., 2010). Conscientious individuals are said to be reliable and strive to succeed; they are expected to take responsibility for their learning (Keller & Karau, 2013). These individuals also strive toward cooperation more than competitiveness (Forrester et al., 2010).

All three of these personalities could be seen as skills when it comes to SSRL, as these characteristics correlate to some degree with the characteristics important for SSRL (Bidjerano & Dai, 2007). As motivation and metacognition play a role in SSRL, extroverted individuals could enhance the task engagement and focus through their active participation (Komarraju et al., 2011). Furthermore, planning out the task and monitoring it also belong to the key characteristics of SSRL, as conscientious individuals are very organized; this could positively correlate with good planning and monitoring during an SSRL task (Bidjerano & Dai, 2007). Agreeable individuals are said to be cooperative, which is also supportive of a good atmosphere and collaborative work, enhancing the behavior and motivational qualities

of SSRL (Forrester et al., 2010; Graziano & Eisenberg, 1997). It is therefore expected that individuals who score high on these personality traits also score high on SSRL.

It is interesting and important to consider the different personality traits in the context of collaborative working, especially how they differ in showing SSRL, because personality traits shape how individuals interact with one another and therefore shape how effective collaboration will be. So, recognizing how these differences manifest in collaborative regulation can provide valuable insights for educators and researchers. Through recognizing patterns, more adaptive and personalized support strategies can be formed. Which in turn can influence more engagement in group work. Especially in the context of SSRL, personality traits influence how individuals contribute and respond to these group regulatory processes, making it important to know how to engage all group members equally to achieve successful SSRL.

Research investigating self-regulation skills and personality traits that influence those skills concludes that individuals high in extraversion and conscientiousness can perform better self-regulation. Extraverted individuals contribute through their positive emotion and motivation, while conscientious individuals show self-discipline and effortful control (Kruglanski et al., 2010).

Agreeableness is said to produce a good working climate as individuals high in agreeableness are said to be good collaborators (Forrester et al., 2010). However, it has not yet been investigated if these traits also have an influence on SSRL. More specifically, how this influence manifests in a shared task.

The research question this study will address is, "To what extent is there a relation between the individual's personality traits of extraversion, agreeableness, and conscientiousness of university students and their level of SSRL during a collaborative problem-solving task? ". It is expected that the collaborative context of SSRL will yield

similar results compared to the individual and group work contexts. These traits, namely extraversion, agreeableness, and conscientiousness, have been identified to be beneficial in an individual as well as in a group context. It is believed that individuals high in these traits are able to exhibit SSRL more, ultimately having higher group outcomes. This would mean that having a variety of group members representing these three different personality types can enhance the group's effectiveness. In prior research, extraversion, agreeableness, and conscientiousness seemed to enhance collaborative work (Durak, 2022). Therefore, the following three hypotheses can be formulated:

H1: Individuals who score high on extraversion will ultimately perform higher levels of SSRL during a collaborative process.

H2: Individuals who score high on agreeableness will ultimately perform higher levels of SSRL during a collaborative process.

H3: Individuals who score high on conscientiousness will ultimately perform higher levels of SSRL during a collaborative process.

Methods

Study Design

The study employed a mixed-methods cross-sectional research design, the personality traits were measured quantitatively, and SSRL was measured qualitatively, to examine the relationship between the personality traits extraversion, agreeableness, and conscientiousness and SSRL in a collaborative digital problem-solving task. The independent variables are the three personality types measured by assessing the score of each participant on these, and the dependent variable is the level of SSRL. In order to measure the independent variable, a questionnaire measuring the personality traits of extraversion, agreeableness, and conscientiousness was used. For measuring the dependent variable, SSRL, the participants were asked to perform a collaborative problem-solving task within a digital environment. The

responses were recorded and coded. By analyzing how personality traits influence the regulation of learning within a collaborative setting, this study aims to deepen the understanding of group dynamics and individual contributions to SSRL.

Participants

The study was conducted using convenience sampling and recruited through snowball sampling, by asking the researchers' network, as well as recruiting participants in the proximity of the research area. The participants were university students from mid-sized universities in the Netherlands and Germany. The final sample consisted of 21 university students, due to time constraints in the participant recruitment and data collection phase. Participants were randomly assigned to groups of 3 members each. The sample included 61.9% male participants ($n = 13$) and 38.1% female participants ($n = 8$); no participants selected "Other" as their gender identity. The average age was 22.3 years ($SD = 1.5$, range = 18–25). In terms of nationality, the majority were German (90.5%), with one Korean participant (4.8%) and one Chinese participant (4.8%). The ethics committee of the University where this study was conducted approved the study prior to data collection.

Materials

Big Five Inventory (BFI)

A subset of the Big Five Inventory (BFI), spanning 30 items investigating the three personality traits of extraversion, agreeableness, and conscientiousness, was used during this study (John & Srivastava, 1999). The BFI demonstrates a high internal consistency (Cronbach's alpha for Extraversion: 0.85, Agreeableness: 0.79, and Conscientiousness: 0.82) as well as the test-retest reliability. The validity of this instrument is also measured as good. The shortened version of the BFI consists of three subscales spanning 26 questions, one for each personality trait (eight questions for extraversion, nine questions for agreeableness, and nine questions for conscientiousness). Each item is scored on a 5-point Likert scale ranging

from 1 (Disagree strongly) to 5 (Agree strongly). An example item for the trait extraversion is "I see myself as someone who is talkative". For Agreeableness, an example item is "I see myself as someone who is helpful and unselfish with others". For conscientiousness, an example item is "I see myself as someone who does a thorough job". The BFI can be found in Appendix A.

Aladdin

To facilitate collaborative problem solving, the software Aladdin was used. Aladdin is a modern design tool used by students or schools for constructing and planning buildings efficiently. It includes a vast database of materials, making the designs more energy-efficient, as well as an incorporated 3D view of the houses built. Additionally, it provides detailed cost estimates, durability assessments, and environmental impact analyses for each material. This tool was chosen because it presented the participants with a challenge most of them were not familiar with, making it easier to foster group interaction as they needed to figure out how the program works as well as how to complete their task in time. The program was chosen to promote collaboration through being a novel task, as students had to rely on each other's contributions and communication to make progress. Within the SSRL framework, this task necessitated students to jointly plan and monitor the task, coordinate their actions, and motivate each other to keep focus. The participants were given a set of rules they had to follow while building their houses; these were used to make the task more difficult for the participants to ensure proper group interaction. Within this research, this tool is used to create a complex task that the group has to solve.

Procedure

The study was conducted in a project room on the campus of the university to ensure a quiet space. Following an introduction by the research team in which the students were briefly introduced to the task they were supposed to fulfil, the participants were asked to fill

out the informed consent before the study started. They were then requested to complete the BFI as well as the uncertainty management questionnaires, which were used for another study. Afterward, a group of 3 students was assigned to build an energy-efficient house in Aladdin. They were given one laptop by the researcher to use collaboratively. This task, which allowed for multiple possible solutions, was designed to encourage discussion and decision-making, thereby providing a basis for measuring SSRL. The participants had 20 to 25 minutes to complete this task.

The task that the participants had to complete went as follows: "Create an energy-efficient house with your teammates for a family of 4 (include the family in the home by adding four people) using one tree, at least three windows, and a door. The house must also be between 8 and 10 meters high. You will have 5 minutes to familiarise yourself with the program and then 25 minutes to complete your task." The task was constructed this way to ensure participants discussed how to build their house. This was done in order to be able to measure SSRL sufficiently. It was printed on a worksheet, where, in addition, a user manual for the software was shown as well to aid the participants if needed. Furthermore, the researcher also had a set of questions ready should the participants need any further help in navigating the task. These questions dealt with how to handle the program properly, and should the participants not find certain objects that they needed, these were set as guidelines in order for the participants to complete the task. The participant's interaction during the collaborative task was video-recorded to be able to code the interaction. Each participant was given a specific participant ID in order to be able to connect the data.

Data analysis

The BFI will be analyzed using the statistical software R**,** employing descriptive statistics (e.g., mean scores and standard deviations) to summarize participants' scores and identify general patterns in abstraction levels.

For the qualitative component, SSRL behaviors observed in the video recordings will be analyzed using a pre-established coding scheme to identify and categorize instances of regulatory strategies within group interactions (Hogenkamp et al., 2021).

First, the data was transcribed, and if necessary, translated into English, as most of the groups were German students and therefore conducted the task in German. Then the group interaction was segmented into speaking turns, and a new turn was defined as any interrupted statement by one participant. A turn began when a participant started speaking and ended when another participant started talking, or a significant pause indicated a speaker change. Each speaking turn was assigned by a participant ID to the right speaker. This process ensured that each unit of dialogue was assigned to the correct participant, allowing for reliable analyses.

Afterwards, the data was uploaded into the atlas.ti software to be able to properly code the data. In order to code SSRL, the participant's answer was coded using the coding scheme provided in the article by Hogenkamp et al. (2021). The coding scheme measures for dimensions of SSRL, namely Metacognition, Cognition, Behavior, and Motivation. Codes can be subdivided among these dimensions, creating subcategories like monitoring task performance or Goal setting in the dimension of Metacognition, for example. The coding process comprises two stages: the initial coding, in which the participant's answers were coded into the subcategories, and the second coding stage, where the codes from the previous coding stage were assigned to one of the four categories of metacognition, cognition, behavior, and motivation. The coding scheme used for the study of Hogenkamp et al (2021) can be found in Appendix C.

After the coding, the code-document was exported into R for further analysis of the code. In R, an individual SSRL score was computed to run a linear model analysis to analyze the relationship between SSRL and the personality traits on the BFI.

Results

The purpose of this analysis was to examine the relationship between university students' personality traits (Extraversion, Agreeableness, Conscientiousness) and their individual SSRL scores on a collaborative digital problem-solving task. These findings suggest that participants engaged most frequently in motivational and metacognitive regulation strategies, while behavioral regulation was observed infrequently. Personality traits were measured on a Likert scale, with mean scores ranging from 2.63 to 4.22 across participants. The descriptive statistics can be seen in Table 2.

Table 1

Descriptive Statistics for Individual SSRL Scores, Subconstructs, and Personality Traits

Variable	Min.	Max.	Mean	SD
SSRL Measures				
Total SSRL Score	1.00	32.00	13.14	7.97
Metacognition	5.00	14.00	8.57	2.62
Cognition	0.00	13.00	4.57	5.22
Motivation	5.00	16.00	9.29	3.90
Behavior	0.00	2.00	0.86	1.01
Personality Traits				
Extraversion	2.63	3.88	3.35	0.35
Agreeableness	2.67	4.11	3.62	0.38
Conscientiousness	3.11	4.22	3.71	0.27

These findings suggest that participants engaged most frequently in motivational and metacognitive regulation strategies, while behavioral regulation was observed infrequently. Personality traits were measured on a Likert scale, with mean scores ranging from 2.63 to 4.22 across participants. The descriptive statistics can be seen in Table 2.

The regression model, which tested the relationship between the individual SSRL scores and the participants scores on the personality test, was not statistically significant, $F(3, 17) = 0.87$, $p = .474$, and accounted for only 13.4% of the variance in SSRL scores ($R^2 = .134$; adjusted $R^2 = -.019$). None of the individual predictors reached statistical significance. In Table 3, the regression coefficients are shown.

Table 2

Multiple Linear Regression Predicting SSRL from Personality Traits

Predictor	*B*	*SE*	*t*	*p*
Intercept	10.63	17.79	0.60	.558
Extraversion	4.19	3.42	1.23	.237
Agreeableness	–6.07	5.28	–1.15	.267
Conscientiousness	2.89	4.20	0.69	.501

The second regression tested the relationship between the individual subcategory scores of SSRL (Metacognition, Cognition, Behavior, and Motivation) per participant and the participants' personality traits.

For Metacognition, the regression showed no statistical significance, $F(3,17) = 2.81$, $p = .071$, it accounted for 33.1% of the variance in metacognition scores ($R^2 = .331$; adjusted $R^2 = -.213$). The analysis also showed that extraversion significantly predicts metacognition ($B = 4.27$, $p = .029$).

Table 3

Multiple Linear Regression Predicting Metacognition from Personality Traits

Predictor	B	SE	t	p
Intercept	–3.64	9.32	–0.39	.701
Extraversion	4.27	1.79	2.38	.029
Agreeableness	–3.08	2.77	–1.11	.282
Conscientiousness	2.14	2.20	0.97	.344

For Cognition, the regression showed no statistical significance, $F(3,17) = .57$, $p = .643$, it accounted for 9.1% of the variance in cognition scores ($R^2 = .091$; adjusted $R^2 = –.069$). None of the personality traits significantly predicted cognition.

Table 4

Multiple Linear Regression Predicting Cognition from Personality Traits

Predictor	B	SE	t	p
Intercept	5.64	4.44	1.27	.221
Extraversion	–0.71	0.85	–0.84	.413
Agreeableness	–0.50	1.32	–0.38	.710
Conscientiousness	0.00	1.05	0.00	.999

For Motivation, the regression also showed no statistical significance, $F(3,17) = .12$, $p = .945$, it accounted for 2.1% of the variance in cognition scores ($R^2 = .021$; adjusted $R^2 = –.151$). None of the personality traits significantly predicted motivation.

Table 5

Multiple Linear Regression Predicting Motivation from Personality Traits

Predictor	B	SE	t	p
Intercept	8.31	8.87	0.94	.362
Extraversion	0.41	1.71	0.24	.811
Agreeableness	–1.57	2.63	–0.60	.558
Conscientiousness	0.03	2.09	0.01	.990

For Behavior, the regression showed statistical significance, $F(3,17) = 4.75$, $p = .014$; it accounted for 45.6% of the variance in behavioral scores ($R^2 = .456$; adjusted $R^2 = .360$). The personality traits Agreeableness ($B = – 0.92$, $p = .010$) and Conscientiousness ($B = 0.72$, $p = .012$) significantly predicted motivation.

Table 6

Multiple Linear Regression Predicting Behavior from Personality Traits

Predictor	B	SE	t	p
Intercept	0.32	1.07	0.29	.773
Extraversion	0.22	0.21	1.06	.303
Agreeableness	–0.92	0.32	–2.88	.010
Conscientiousness	0.72	0.25	2.83	.012

Correlation analyses further revealed weak associations between SSRL and each personality trait: extraversion ($r = .05$), agreeableness ($r = –.17$), and conscientiousness ($r = .16$). No multicollinearity issues were detected (VIFs < 2), and inspection of residuals indicated that assumptions of linear regression were met. Regarding personality traits, extraversion showed a moderate positive correlation with metacognition ($r = .51$), while conscientiousness was moderately correlated with behavior ($r = .43$). Agreeableness showed a weak negative relationship with behavior ($r = –.32$). The remaining correlations between

personality traits and SSRL subscales were weak or negligible. As in the overall model, none

of the correlations between predictors exceeded .70, indicating no multicollinearity concerns.

Table 7

Correlation table

Variable	1	2	3	4	5	6	7	8
SSRL Measures								
SSRL Score	—							
Metacognition	.23	—						
Cognition	—	.07	—					
Motivation	—	.50	–.03	—				
Behavior	—	.53	.20	.11	—			
Personality traits								
Extraversion	.23	.51	–.29	–.02	.10	—		
Agreeableness	–.08	.10	–.23	–.13	–.32	.52	—	
Conscientiousness	.19	.33	–.12	–.03	.43	.36	.33	—

Discussion

Key Findings and Interpretation of Results

The current study aimed to investigate whether the personality traits of extraversion,

agreeableness, and conscientiousness predict university students' level of SSRL during a

digital problem-solving task. Although the overall regression model predicting total SSRL

scores was not statistically significant, analyses of individual SSRL subscales showed

significance that offers insight into how personality may shape specific regulatory strategies.

Consistent with previous literature suggesting that extraversion is associated with

active engagement (Komarraju et al., 2011), extraversion significantly predicted

metacognitive regulation. Participants scoring higher on extraversion were likelier to engage

in metacognitive behaviors, such as monitoring the group's comprehension and task orientation. This aligns with previous research that emphasizes the social, expressive, and reflective nature of learners (Bidjerano & Dai, 2007). Extravert characteristics tend to promote dialogue-driven regulation, further supporting metacognition. Furthermore, extraversion is linked to reward sensitivity, especially during social interactions. During metacognitive regulation, extraverts interact with the group, which in turn motivates them to stay active during a group interaction (Müller et al., 2023). Therefore, the reason why this statistical significance was only found for the metacognitive trait and not for other subconstructs might be due to the fact that, for example, motivational and cognitive regulation rely more on internal drive and information processing and not on social expressiveness alone, as is more the case in metacognition.

The regression predicting behavioral regulation also showed statistical significance, with agreeableness negatively predicting behavior and conscientiousness positively predicting behavior. The negative relationship between agreeableness and behavior may suggest that agreeable students, who tend to prioritize harmony and consensus, may hesitate to assert or initiate task-related actions in group environments as they try to avoid negative feedback or criticism. This contradicts the previously assumed hypothesis, as high agreeableness does not predict high SSRL in this study. This can be explained by the fact that highly agreeable individuals have more people pleasing tendencies, therefore not asserting themselves and their own ideas in group settings, resulting in lower SSRL behaviors.

However, conscientiousness, which is said to be associated with goal-directed behavior and being organized (McCrae, 1997), was found to positively predict regulation of behavior. This could indicate that conscientious individuals are more likely to translate planning into observable task-related actions by motivating a group to pursue their goals, by

trying to include everyone in the process, and correcting the behavior of others that hinder the completion of the group goal.

Other subcomponents of SSRL, namely cognition and motivation, were not found to have any statistically significant prediction for any personality trait, as well as that the full SSRL model was only explained by a small portion of the variance, resulting in the rejection of the hypothesis. This highlights the importance of examining SSRL as a multidimensional construct rather than a single entity, as personal dispositions, such as personality traits, might correlate more with distinct regulatory strategies. While these findings suggest that personality traits influence certain regulatory behaviors, other contextual, individual, and task-specific aspects need to be taken into consideration as well when examining SSRL.

The collaborative task given to the students required them to navigate an unfamiliar program as well as complete the task under time pressure. It also posed the challenge of clear and good communication, as only one student could operate the laptop at a time. This setup intentionally created an atmosphere where the students had to react and interact with one another, fostering SSRL. During the task, this was done by students through observable behaviours like setting group goals and performing time management and task focus, all key behaviors found within SSRL. The personality traits were also observable through this task, as for example, more extraverted individuals tended to take the group lead and prompted the others to engage in the task as well.

One of the biggest differences between the current study and previous research that might explain differences in results lies in the measurement method. In previous research, SSRL was measured using self-reported measurements (Panadero & Järvelä, 2015), whereas this study employed observational coding. This difference is important, because different to previous research, not the participants' perceptions but their actual behavior was measured.

Implications

The findings of this study have multiple practical and theoretical implications for the research. First, the positive relationship between extraversion and metacognition suggests that more extraverted individuals may be more inclined to actively engage in planning and regulatory strategies during group problem-solving tasks. Researchers and educators can harness this in designing collaborative tasks that explicitly support verbal reasoning, such as encouraging the group to discuss about the task at hand and have specific roles like time keeper to actively participate in the problem solving of the task, and planning, which in turn supports metacognitive engagement across all personality types.

Secondly, the findings on agreeableness and conscientiousness on behavior emphasize the importance of tailoring group roles and set-up based on learning preferences, which in this instance refers to students' ability to regulate, process, and contribute to a collaborative task. For instance, more agreeable students might benefit more from explicit prompts to assert their ideas and take a more active part in the group discussion, as they tend to prioritize group harmony and therefore are not as assertive in a group environment. Conscientious individuals may especially benefit from planning or time-management roles.

When looking at these findings in a broader context, they emphasize the need for personalized learning support in collaborative environments. This study showed that personality traits shaped students' engagement with specific aspects of SSRL, which indicates that students do not approach socially shared regulation in the same way. Therefore, there is a need for tailored support to engage all students equally in the task so that the collaboration does not become unbalanced. This tailoring can ensure that all personality types, and therefore students, can engage equally in a problem-solving task and built these regulatory skills. As was discussed in the beginning, each individual comes with a unique skill set that can benefit the group if it is adequately harnessed, so this tailoring of a task to

the specific needs of each student in a group will help bring forth each unique skill each student possesses, ultimately benefiting the group outcome (Järvelä & Hadwin, 2013). Therefore, as personality traits might interact with SSRL in distinct ways, interventions at the group level might be insufficient. Instead, researchers should focus on how to engage every group member simultaneously in a collaborative task while also, to some extent, fulfilling their individual needs to harness the most beneficial outcome.

On a theoretical level, these findings contribute to the growing body of research into SSRL and its workings by emphasizing that SSRL is not only context-dependent but also influenced by individual traits. This calls for more research into how SSRL can be predicted through dispositional and situational factors to better predict learning behaviors.

Moreover, it highlights the importance of recognizing individual differences within groups. Traits such as behavior and metacognitive skills may influence the effectiveness of SSRL within a group. Additionally, an individual's social competencies could further impact SSRL. Considering this diversity is crucial for developing more personalized and effective collaborative learning environments.

Strengths and Contributions

This study contributes to the growing body of research as it looks into how individual aspects influence SSRL. As this study showed positive results in how personality traits can influence the occurrence of SSRL.

By focusing on individual-level SSRL behaviors within group-based problem-solving tasks, this study addresses a relatively underexplored area of SSRL research. Much of previous research has focused on either individual learning or group-level processes; this study connects these two by assessing how individual personality traits may influence regulation strategies during collaborative work.

Furthermore, this study relies on direct behavioral measures of SSRL, rather than relying on self-reported measures. This provides a more nuanced understanding of how learners actually behave. As well as the integration of a structured coding scheme adds further methodological rigor.

The incorporation of the Five-Factor model provides the research with a stable individual trait, which makes the interpretation of individual differences easier. This provides meaningful insights into how stable personality traits may be related to learning behaviors.

This study contributes to educational practices and instructional design by identifying personality traits in collaborative problem-solving tasks. These findings could broaden the research by developing more adaptive, personalized learning environments.

Limitations and Future Directions

Several limitations should be considered. One major limitation is the small sample size, which likely reduced statistical power, as well as only testing on university students, possibly affecting its transferability. Moreover, the digital problem-solving environment limited interactivity, as only one participant was able to control the software at a time. This constraint may have reduced opportunities for active participation of some of the group members, thereby limiting the expression and observation of socially shared regulation strategies across group members.

Another limitation is the fact that the hypotheses were overly broad, examining SSRL as a single construct rather than addressing its four subcategories. As also from previous research, it could be inferred that certain personality traits relate more strongly to certain SSRL subcategories. Testing the subcategories could have yielded more nuanced and tailored insights.

Additionally, SSRL was operationalized using behavioral coding from collaborative sessions, whereas personality traits were measured using a self-reported questionnaire. This

may have influenced the strength and interpretability of the observed relationships, as self-reported measures can be prone to bias, potentially falsifying the results.

Furthermore, SSRL scores were based on frequency counts, which may not fully capture the quality or depth of regulatory contributions, as the coding was only done by one researcher and may therefore be prone to being subjective.

Future research should investigate these findings with a larger sample size, as well as multiple group tasks to assess variability across different collaborative contexts better. This would allow for a more comprehensive understanding of how regulatory behaviors emerge and vary depending on task type, group composition, or problem complexity. Future research should also further examine the relationship between the three personality types and the subtypes of SSRL, as the present findings suggest that the different traits may influence distinct aspects of socially shared regulation in collaborative problem-solving tasks.

Furthermore, future research should investigate potential mediating or moderating variables to enhance our understanding of the mechanisms through which individual traits influence SSRL within group settings (Järvelä et al., 2015).

Concluding Remarks

The goal of this research was to examine the influence of individual personality traits, specifically extraversion, agreeableness, and conscientiousness, on SSRL during a digital problem-solving task among university students. While the overall regression model for SSRL was not statistically significant, analyses of the SSRL subcategories revealed significant insights. As extraversion positively predicted metacognition, and both agreeableness and conscientiousness were found to significantly predict behavior. These findings suggest that personality traits do, to some degree, influence SSRL and that it is of importance for future research to further investigate how these traits influence SSRL.

This study contributes to the growing body of research by suggesting that personality traits may shape how learners regulate their cognitive, motivational, metacognitive, and behavioral strategies collectively in a group.

Furthermore, these results advocate for the design of collaborative learning environments to prioritize an interface that boosts interaction and collaboration to foster SSRL. It was shown that depending on the personality type, different individuals need different support. So, tailoring tasks with this knowledge would be beneficial for the engagement and ultimately the learning outcome.

However, this study is limited in its ability to contribute meaningfully due to its small sample size and reliance on only a single measurement tool for SSRL. As well as a digital environment that constrains participants in their collaboration efforts.

Overall, this study reinforces the notion that effective SSRL is a multifaceted construct, influenced by many personal and contextual attributes. These findings show that personality traits can have an influence on collaboration and SSRL. However, the extent and nature of this influence warrant further investigation to draw more definitive conclusions and inform educational practice.

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Appendix A

Note: Personality questionnaire

Personality Questionnaire

Q30 Indicate your participant number

_____

Q0 Indicate your Nationality

_____

Q29 Indicate your Age

_____

Q1 Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please click the box to indicate the extent to which you agree or disagree with the statements.   I see Myself as Someone Who...

Q2 ... is talkative

◯ Disagree strongly (1)

◯ Disagree a little (2)

◯ Neither agree nor disagree (3)

◯ Agree a little (4)

◯ Agree strongly (5)

Q3 ... is reserved

◯ Disagree strongly (1)

◯ Disagree a little (2)

◯ Neither agree nor disagree (3)

◯ Agree a little (4)

◯ Agree strongly (5)

Q4 ... is full of energy

◯ Disagree strongly (1)

◯ Disagree a little (2)

◯ Neither agree nor disagree (3)

◯ Agree a little (4)

◯ Agree strongly (5)

Q5 ... generates a lot of enthusiasm

○ Disagree strongly (1)

○ Disagree a little (2)

○ Neither agree nor disagree (3)

○ Agree a little (4)

○ Agree strongly (5)

Q6 ... tends to be quiet

○ Disagree strongly (1)

○ Disagree a little (2)

○ Neither agree nor disagree (3)

○ Agree a little (4)

○ Agree strongly (5)

Q7 ... has an assertive personality

○ Disagree strongly (1)

○ Disagree a little (2)

○ Neither agree nor disagree (3)

○ Agree a little (4)

○ Agree strongly (5)

Q8 ... is sometimes shy, inhibted

○ Disagree strongly (1)

○ Disagree a little (2)

○ Neither agree nor disagree (3)

○ Agree a little (4)

○ Agree strongly (5)

Q9 ... is outgoing, sociable

○ Disagree strongly (1)

○ Disagree a little (2)

○ Neither agree nor disagree (3)

○ Agree a little (4)

○ Agree strongly (5)

End of Block: Extraversion

Start of Block: Agreeableness

Q10 ... tends to find fault with others

○ Disagree Strongly (1)

○ Disagree a little (2)

○ Neither agree nor disagree (3)

○ Agree a little (4)

○ Agree strongly (5)

Q11 ... is helpful and unselfish with others

○ Disagree Strongly (1)

○ Disagree a little (2)

○ Neither agree nor disagree (3)

○ Agree a little (4)

○ Agree strongly (5)

Q12 ... starts quarrels with others

○ Disagree Strongly (1)

○ Disagree a little (2)

○ Neither agree nor disagree (3)

○ Agree a little (4)

○ Agree strongly (5)

Q13 ... has a forgiving nature

○ Disagree Strongly (1)

○ Disagree a little (2)

○ Neither agree nor disagree (3)

○ Agree a little (4)

○ Agree strongly (5)

Q14 ... is generally trusting

◯ Disagree Strongly (1)

◯ Disagree a little (2)

◯ Neither agree nor disagree (3)

◯ Agree a little (4)

◯ Agree strongly (5)

Q15 ... can be cold and aloof

◯ Disagree Strongly (1)

◯ Disagree a little (2)

◯ Neither agree nor disagree (3)

◯ Agree a little (4)

◯ Agree strongly (5)

Q16 ... is considerate and kind to almost everyone

◯ Disagree Strongly (1)

◯ Disagree a little (2)

◯ Neither agree nor disagree (3)

◯ Agree a little (4)

◯ Agree strongly (5)

Q17 ... is sometimes rude to others

○ Disagree Strongly (1)

○ Disagree a little (2)

○ Neither agree nor disagree (3)

○ Agree a little (4)

○ Agree strongly (5)

Q18 ... likes to cooperate with others

○ Disagree Strongly (1)

○ Disagree a little (2)

○ Neither agree nor disagree (3)

○ Agree a little (4)

○ Agree strongly (5)

End of Block: Agreeableness

Start of Block: Conscientiousness

Q19 ... does a thorough job

○ Disagree Strongly (1)

○ Disagree a little (2)

○ Neither agree nor disagree (3)

○ Agree a little (4)

○ Agree strongly (5)

Q20 ... can be somewhat careless

○ Disagree Strongly (1)

○ Disagree a little (2)

○ Neither agree nor disagree (3)

○ Agree a little (4)

○ Agree strongly (5)

Q21 ... is a reliable worker

○ Disagree Strongly (1)

○ Disagree a little (2)

○ Neither agree nor disagree (3)

○ Agree a little (4)

○ Agree strongly (5)

Q22 ... tends to be disorganized

○ Disagree Strongly (1)

○ Disagree a little (2)

○ Neither agree nor disagree (3)

○ Agree a little (4)

○ Agree strongly (5)

Q23 ... tends to be lazy

◯ Disagree Strongly (1)

◯ Disagree a little (2)

◯ Neither agree nor disagree (3)

◯ Agree a little (4)

◯ Agree strongly (5)

- -

Q24 ... perseveres until the task is finished

◯ Disagree Strongly (1)

◯ Disagree a little (2)

◯ Neither agree nor disagree (3)

◯ Agree a little (4)

◯ Agree strongly (5)

- -

Q25 ... does things efficiently

◯ Disagree Strongly (1)

◯ Disagree a little (2)

◯ Neither agree nor disagree (3)

◯ Agree a little (4)

◯ Agree strongly (5)

- -

Q26 ... makes plans and follows through with them

◯ Disagree Strongly (1)

◯ Disagree a little (2)

◯ Neither agree nor disagree (3)

◯ Agree a little (4)

◯ Agree strongly (5)

Q27 ... is easily distracted

◯ Disagree Strongly (1)

◯ Disagree a little (2)

◯ Neither agree nor disagree (3)

◯ Agree a little (4)

◯ Agree strongly (5)

End of Block: Conscientiousness

Appendix B

Note: Worksheet given to participant's

Study design

Welcome to our Study! We are a group of bachelor students currently writing our bachelor thesis. This experiment is part of our thesis and will hopefully help us find valuable insights into group work. In the following, you will find a Task that we ask you to complete with your group. You are encouraged to talk and discuss during the following, so please do so :) You were already asked to fill out one questionnaire and will be asked to fill out another after the group task is done. If you have any further questions you can always ask the researchers. Below you can also find a user manual for the program you will be using Aladdin. Please indicate your participation numbers below. Thank you for your participation and have fun!!!

Participation number:
Participation number:
Participation number:
Participation number:

Task:

Create an energy-efficient house with your teammates for a family of 4 (include the family in the home by adding four people) using one tree, at least three windows, and a door. The house must also be between 8 and 10 meters high. You will have 5 minutes to familiarise yourself with the program and then 25 minutes to complete your task.

User-manual for Aladdin:

- On the top right bar, all the tools for building your house can be found
- On the top left you can find the main menu here it is possible to change the direction of the house and find additional information about various topics, furthermore here you can also find the sticky note accessory
- You can use the Analysis tools under the main menu to find how much your energy your house is using

Additional help:
- Check the direction of the sun in relation to where the house is standing
- What about trees? Are they in the way?
- Did you do everything possible to be as energy efficient as you can be ;)?
- Is there any additional help the program gives you that you did not use?
- Take a look in the main menu under the tap tutorials
- Have a look at the analysis tab

Appendix C

Note: Coding Scheme

Table 3. The four categories of SSRL, their subcategories and their codes.

Category [1]	Task Regulation	Group Regulation
Metacognition	*Task planning* Goal setting Task planning *Task monitoring* Monitoring task progress Monitoring task performance Monitoring comprehension Task perceptions *Task evaluation* Evaluating task outcome	*Group planning* Coordinating collaboration *Group monitoring* Monitoring group performance
Cognition	*Task cognition* Verifying Learning strategies	
Behavior		*Positive social interactions* Inclusion *Negative social interactions* Disrespect Correcting behavior
Motivation	*Task motivation* Stimulating task focus Praising	

[1]The codes and subcategories were built upon categories mentioned in the work of Hadwin et al. [13].

Appendix D

```
##SSRL complete##

# Take the existing column names…
old_names <- colnames(SSRL_Final)

# Build new names by removing "\n" and everything after it
new_names <- sub("\\n.*$", "",  old_names)

# Assign them back
colnames(SSRL_Final) <- new_names

names(SSRL_Final) <- gsub("○", "", names(SSRL_Final))


# Verify
print(colnames(SSRL_Final))

#long format#
ssrl_long <- SSRL_Final %>%
  pivot_longer(cols = c(2, 3, 4, 13:30),  # only these columns
          names_to = "participant_id",
          values_to = "ssrl_score")

ssrl_filtered <- ssrl_filtered %>% select(-...1)

ssrl_filtered <- ssrl_long %>%
  filter(ssrl_score > 0)
#delete rows#
ssrl_filtered <- ssrl_filtered [-c(22:42), ]

##BIF complete##

###clean dataset###
##rename dataset##
BIF <- Personality_Questionnaire_May_17_2025_14_59
##delet columns##
BIF <- BIF %>% select(-StartDate, -EndDate, -Status, -IPAddress, -Progress, -`Duration (in
seconds)`, -Finished, -RecordedDate, -ResponseId, -RecipientLastName, -
RecipientFirstName, -RecipientEmail, -ExternalReference, -LocationLatitude, -
LocationLongitude, -DistributionChannel, -UserLanguage)
BIF <- BIF %>% select(-Q0, -Q29)
##delte rows##
BIF <- BIF [-c(1:2), ]
BIF <- BIF [-c(13), ]
##likert scale##
likert_levels <- c("Disagree strongly", "Disagree a little", "Neither agree nor disagree",
"Agree a little", "Agree strongly")

BIF_numeric <- BIF
```

```
BIF_numeric[] <- lapply(BIF, function(x) as.numeric(factor(x, levels = likert_levels, ordered
= TRUE)))

##na##
BIF_numeric <- BIF_numeric [-c(13), ]
BIF_numeric <- BIF_numeric %>% select(-Q30)
BIF_numeric[is.na(BIF_numeric)] <- 3

##rename col##
#Extraversion#
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q2"] <- "1"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q3"] <- "6R"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q4"] <- "11"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q5"] <- "16"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q6"] <- "21R"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q7"] <- "26"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q8"] <- "31R"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q9"] <- "36"
#Agreeableness#
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q10"] <- "2R"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q11"] <- "7"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q12"] <- "12R"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q13"] <- "17"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q14"] <- "22"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q15"] <- "27R"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q16"] <- "32"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q17"] <- "37R"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q18"] <- "42"
#Conscientiousness#
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q19"] <- "3"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q20"] <- "8R"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q21"] <- "13"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q22"] <- "18R"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q23"] <- "23R"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q24"] <- "28"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q25"] <- "33"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q26"] <- "38"
colnames(BIF_numeric)[colnames(BIF_numeric) == "Q27"] <- "43R"


##Columns to reverse##
cols_to_reverse <- c("6R", "21R", "31R", "2R", "12R", "27R", "37R", "8R", "18R", "23R",
"43R")

##Reverse the scale (1 to 5) for selected columns##
BIF_numeric[cols_to_reverse] <- 6 - BIF_numeric[cols_to_reverse]

##row means Personality##
BIF_numeric$extraversion_mean <- rowMeans(BIF_numeric[, c("1", "6R", "11", "16",
"21R", "26", "31R", "36")], na.rm = TRUE)
```

```
BIF_numeric$agreeableness_mean <- rowMeans(BIF_numeric[, c("2R", "7", "12R", "17",
"22", "27R", "32", "37R", "42")], na.rm = TRUE)
BIF_numeric$conscientiousness_mean <- rowMeans(BIF_numeric[, c("3", "8R", "13",
"18R", "23R", "28", "33", "38", "43R")], na.rm = TRUE)

#participant_id#
library(dplyr)

BIF_numeric <- BIF_numeric %>%
  mutate(participant_id = case_when(
    row_number() %in% 1 ~ "003",
    row_number() %in% 2 ~ "001",
    row_number() %in% 3 ~ "002",
    row_number() %in% 4 ~ "p007",
    row_number() %in% 5 ~ "p009",
    row_number() %in% 6 ~ "p004",
    row_number() %in% 7 ~ "p006",
    row_number() %in% 8 ~ "p005",
    row_number() %in% 9 ~ "p008",
    row_number() %in% 10 ~ "p018",
    row_number() %in% 11 ~ "p019",
    row_number() %in% 12 ~ "p020",
    row_number() %in% 13 ~ "p022",
    row_number() %in% 14 ~ "p023",
    row_number() %in% 15 ~ "p021",
    row_number() %in% 16 ~ "p032",
    row_number() %in% 17 ~ "p030",
    row_number() %in% 18 ~ "p031",
    row_number() %in% 19 ~ "p025",
    row_number() %in% 20 ~ "p026",
    row_number() %in% 21 ~ "p024",
    TRUE ~ NA_character_
  ))


##merge datasets##

BIFSSRL_complete <- left_join(BIF_numeric, ssrl_filtered, by = "participant_id")


model <- lm(ssrl_score ~ extraversion_mean + agreeableness_mean +
conscientiousness_mean, data = BIFSSRL_complete)
summary(model)

summary(BIFSSRL_complete[, c("ssrl_score", "extraversion_mean", "agreeableness_mean",
"conscientiousness_mean")])

library(car)
vif(model)
```

```
# Residual plots
plot(model$fitted.values, model$residuals)
abline(h = 0, col = "red")

# Q-Q plot
qqnorm(model$residuals)
qqline(model$residuals, col = "blue")

# Shapiro-Wilk test for normality
shapiro.test(model$residuals)

cor(BIFSSRL_complete[, c("ssrl_score", "extraversion_mean", "agreeableness_mean",
"conscientiousness_mean")], use = "complete.obs")

# Descriptive stats
summary(BIFSSRL_complete[, c("Metacognition", "Cognition", "Motivation", "Behavior")])

sapply(BIFSSRL_complete[, c("Metacognition", "Cognition", "Motivation", "Behavior")],
sd)


sapply(BIFSSRL_complete[, c("extraversion_mean", "agreeableness_mean",
"conscientiousness_mean")], sd)

sd(BIFSSRL_complete$ssrl_score, na.rm = TRUE)


model <- lm(ssrl_score ~ extraversion_mean + agreeableness_mean +
conscientiousness_mean, data = BIFSSRL_complete)
summary(model)


model <- lm(behavior_individual ~ extraversion_mean + agreeableness_mean +
conscientiousness_mean, data = BIFSSRL_complete)
summary(model)

model <- lm(motivation_individual ~ extraversion_mean + agreeableness_mean +
conscientiousness_mean, data = BIFSSRL_complete)

model <- lm(metacognition_individual ~ extraversion_mean + agreeableness_mean +
conscientiousness_mean, data = BIFSSRL_complete)

model <- lm(cognition_individual ~ extraversion_mean + agreeableness_mean +
conscientiousness_mean, data = BIFSSRL_complete)



cor(BIFSSRL_complete[, c("metacognition_individual","cognition_individual",
"motivation_individual", "behavior_individual", "extraversion_mean",
"agreeableness_mean", "conscientiousness_mean")], use = "complete.obs")
```