Exploring the Relation between ADHD Symptoms, Self-Compassion and Self-Regulated Learning Strategies in First Year Psychology Students

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Abstract

The current study investigates the relationship between ADHD symptoms, self-compassion, and self-regulated learning strategies in university students. This is a relevant population to study because there is little research on university students with ADHD. The participants were 168 first year psychology students, aged 16 to 29 years. They completed the Connors' Adult ADHD Rating Scales (CAARS), the Motivated Strategies for Learning Questionnaire (MSLQ) and the Self-Compassion Scale (SCS). To investigate how these variables relate to each other the bivariate relations were analyzed, and two models were explored: a mediation and a moderation model. The findings suggest that ADHD symptoms relate to less self-compassion and to less use of self-regulated learning strategies. However, self-compassion was not related to self-regulated learning strategies when controlling for ADHD symptoms. Additionally, both models were also not found to be significant. In conclusion, more research is needed to understand ADHD symptoms in university students, especially with the use of subscales from the different measures.

Exploring the Relation between ADHD Symptoms, Self-Compassion and Self-Regulated Learning Strategies in First Year Psychology Students

Attention-deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder that is primarily diagnosed in childhood, yet its impact extends across various stages of an individual's life (Faraone et al., 2021, Kooij et al., 2018). As stated in the DSM-5, the symptoms of ADHD are inappropriate levels of inattention, hyperactivity, and impulse control that interfere with functioning or development (American Psychiatric Association, 2013). According to Kooij et al. (2018) approximately 3-5 % of children meet the diagnostic criteria for ADHD. The prevalence of ADHD in adults is estimated to range between 1.4% and 3.6% (Kooij et al., 2018). While the diagnostics and treatment services are well established for the younger population, for adults these lag behind. This might especially be important for college students with ADHD, who are more likely to have higher ability levels, greater academic success, and better compensatory skills during primary and secondary school, than general population ADHD patients (Frazier et al., 2007). Due to these characteristics, they have fewer problems with their ADHD in earlier educational stages. However, when the study load and standards increase after transitioning to college, they might encounter these problems for the first time. This is because they are less prepared for the new tasks / abilities that college demands of students (Stevens et al., 2023). They might also abruptly lose parental assistance and support, due to moving away from home. This can be detrimental to students with ADHD because they often need parental supervision for structure (Fleming & McMahon, 2012).

In college students ADHD symptoms can have an impact on their social life, academics, and work. The hyperactive-impulsive symptoms diminish with age. College students thus present less of these symptoms than younger groups, while the inattention symptoms seem to persist (DuPaul et al., 2009; Weyandt & DuPaul, 2008). Related to this,

DuPaul et al. (2017) found that students with ADHD, arriving at college, have a decreased engagement with academic tasks, compared with nondiagnosed students. Executive functioning (EF) deficits have also been related to ADHD (Willcut et al., 2005). EF involves planning, organizing, and regulating behavior. This imposes a problem especially for college students with ADHD who transition from high school to college, where there is less structure, higher expectations, and often less parental support due to moving out. A meta-analysis from Frazier et al. (2007) found a moderate to large discrepancy in academic achievement between college students with and without ADHD, as individuals who were diagnosed showed lower academic achievement. An indicator for this may be that ADHD patients who experience challenges from the inattention symptoms may continuously miss information during lectures and while studying (Kooij et al., 2018). Adults with the hyperactive symptoms tend to have more feelings of restlessness or agitation (Kooij et al., 2018). They have ceaseless mental activity and may need alcohol or drugs to relax or sleep. These factors may make it harder for a student to regulate their learning and perform to their full potential. More research into the relation between ADHD in college students and their academic achievement may give indications for future intervention creation.

Another factor of importance is self-compassion, which is negatively associated with ADHD (Willoughby & Evans, 2019). A reason for this is that people with ADHD seem to be more self-critical of their performance due to their deficits. Subsequently low self-compassion is also related to poorer academic achievement (Tang, 2019). Taking these variables together, this study will investigate the relations of ADHD symptoms, self-compassion, and self-regulated learning.

Self-Regulated Learning

There are many factors that affect the prediction of academic achievement in students with and without ADHD. One of these is the use of self-regulated learning (SRL) strategies.

SRL strategies is the actively self-controlled behavior of planning, motivation, and cognition for the purpose of achieving academic goals (Pintrich, 1995; Shelton et al., 2019). This means that individual students can regulate themselves without other external motivational resources (e.g., the motivation to get a certain grade, to pass the course).

According to Pintrich (1995) SRL strategies consist of three components. The first one is that students attempt to control their behavior, cognition, motivation, and affect. Secondly the student needs a goal that they are trying to accomplish. Lastly the student needs to be in control themselves, as opposed to being controlled by a parent or teacher. Students who are capable of using SRL strategies often obtain better grades (Shelton et al., 2019). This means that SRL strategies are positively related to academic achievement. While for some it may be harder than for others, SRL strategies can be learned and are not fixed through development (Pintrich, 1995). The Motivated Strategies for Learning Questionnaire is a well-validated instrument for measuring SRL strategies (Pintrich et al., 1993).

Research by Shelton et al. (2019) has shown that inattention symptoms from ADHD predict less use of SRL strategies. This means that college students showing inattention difficulties may encounter greater challenges in applying self-regulatory strategies when studying, which could result in lower academic performance (Bernacki et al., 2023; Gormley et al., 2018). A factor that might influence the relation between ADHD and the use of SRL strategies, is self-compassion (Willoughby and Evans, 2019).

Self-Compassion

Individuals who live with ADHD have been found to be more self-critical in general, due to mistakes they make in relation to their deficits (Willoughby and Evans, 2019). Self-criticism is a part of self-compassion, which has been related to academic achievement (Tang, 2019). Self-compassion is a way of being supportive for oneself when experiencing personal suffering, failure, or inadequacy (Neff, 2023). It is seen as a continuum and consists of six

main elements: Self-kindness versus Self-judgment, Common Humanity versus Isolation, and Mindfulness versus Overidentification.

Self-kindness involves an acceptance of one's shortcomings without judgements, and with care for oneself. This helps to decrease feelings of unworthiness (Neff, 2023). With this comes an actively showing concern for the distress one feels and responding to this with warmth. This can make an individual feel supported and validated in a same way as they receive kindness from others. Self-judgment is the opposite of self-kindness where an individual is very self-critical.

Common humanity means that an individual feels connected to others (Neff, 2023). An individual is mostly at risk losing this sense of common humanity when they fail, make mistakes, or go through difficult life circumstances. A common reaction is to feel that everyone else is doing better than oneself, which creates a sense of loneliness and disconnection. Understanding that everyone experiences suffering makes one feel less isolated and lonely, since failure and going through challenging times is a part of being human.

Mindfulness is an acknowledgement of discomfort in the here and now (Neff, 2023). To be able to show yourself compassion, you must acknowledge the pain you are experiencing. Fighting or resisting it may only make it worse, absorbing your attention into the pain. Overidentification happens when an individual ruminates so much about their suffering that the suffering becomes definitive or permanent in their eyes. Being able to be mindful and see those thoughts and feelings as they are in this moment in time counters this overidentification.

Research by Willoughby & Evans (2019) has investigated the level of self-compassion in a sample of undergraduates with ADHD or learning disabilities. They showed that their sample had lower scores of self-compassion in comparison to other (non-ADHD) samples.

This implies that college students with ADHD might be more self-critical when making mistakes that relate to their deficits.

Research has found self-compassion to be related to important parts of self-regulated learning. An experiment by Breines & Chen (2012) showed that a group of undergraduate students that failed an initial assignment, increased their study time when primed with self-compassion. This increased study time was significantly longer than for the control group and for a self-esteem group (a group that was primed with self-esteem). Together with their other experiments they provided support for the claim that self-compassion leads to an increased self-improvement motivation (Breines & Chen, 2012). This can be conceptually linked to SRL strategies which include motivation and goal-oriented behavior. Another study by Sirois (2014) found a negative association between self-compassion and procrastination and procrastination would be an opposite to SRL strategies (self-control in particular). This could a indicate a negative association between self-compassion and the use of SRL strategies. The study by Willoughby and Evans (2019) however did not find a significant association between self-compassion and SRL strategies. This could be due to the methodology, sample size (n=78), or because there is no association. Taking all the previous research together, the relation between self-compassion and SRL strategies is interesting to investigate further.

Overall, these findings suggest an association between self-compassion and SRL strategies. There are already interventions studied to increase self-compassion, which show promising results for healthy self-regulation (Dundas et al., 2017). It would therefore make sense to investigate the relation self-compassion has with ADHD symptoms and SRL strategies for college students. This population still lags behind with regard to interventions because of lacking theoretical knowledge.

Research Question and Hypotheses

As shown in the previous sections, there has been support for the existence of associations between ADHD, self-regulated learning, and self-compassion. Understanding how exactly these variables associate to each other may give insights in how to develop interventions. This study will try to replicate findings from Shelton et al. (2019) and Willoughby & Evans (2019) to improve robustness of the scientific evidence-base and then explore the possibility of a mediation or moderation model. The research question is therefore: Does self-compassion mediate or moderate the relationship between ADHD symptoms and self-regulated learning strategies in college students? For the purpose of this research question a dimensional approach to ADHD symptoms is used. Dimensional approaches tend to have greater predictive validity if used for disorders that represent extreme expression of normal variation, as in ADHD (Coghill & Sonuga Barke, 2012).

The first hypothesis is that ADHD symptoms are negatively correlated with SRL strategies. The second hypothesis is that ADHD symptoms are negatively correlated with self-compassion. The third hypothesis is that self-compassion is positively correlated with SRL strategies when controlling for ADHD symptoms. Finally, it will be explored whether self-compassion mediates or moderates the relation between ADHD and SRL strategies.

Method

Participants

The sample of our study consisted of first-year students from the Dutch and International track of the Psychology BSc. program of the University of Groningen (UG). The participant recruitment was facilitated through the Experiment Management System (SONA), serving as an integral component of the students' coursework. Participation was entirely voluntary. As a compensation for the involvement in the study all participants received a small amount of course credits (SONA credits) needed for the completion of their class.

Prior to the involvement in the present study participants underwent a self-report assessment on ADHD symptomatology (see materials section). Inclusion criteria for this study consisted of language proficiency in English and presence of the self-report assessment on ADHD symptoms. The sample consisted of N = 237 participants, but 69 were excluded from the analysis for reasons such as incomplete data or failure to correctly answer the honesty/attention question and the inconsistency/infrequency index (see materials section). This resulted in a final sample of N = 168, of which 22.6% were male (n=38), 75.6% female (n=127), and 1.8% other (n=3). The mean age was 19.7.

Materials

Motivated Strategies for Learning Questionnaire

The Motivated Strategies for Learning Questionnaire (MSLQ) investigates both motivational and cognitive components of academic learning strategies (Pintrich, 1995). The sum of this self-reported instrument includes 85 items, which were designed to measure the attitudes and learning strategies (Wang et al., 2022). In our study, the questions were referred to the course Introduction to Psychology (English track) or “Overzicht in de psychologie” (Dutch track). Items are scored through a 7-point Likert-type scale ranging from 1 (not at all true of me) to 7 (very true of me). The MSLQ is originally divided into fifteen different subscales.

Hilpert et al. (2013), however, did a confirmatory factor analysis with these subscales. They found that the hypothesized latent factor structure within the original MSLQ model demonstrates systematic deficiencies. Hilpert et al. (2013) provided an alternative with three factors (expectancy, value, and self-regulation), but with only the use of six subscales. The other subscales were removed because of multiple reasons (e.g., low alpha). This version was also used by Shelton et al. (2019), from which the present study will try to replicate findings. These were the reasons to measure only the items corresponding to the six subscales. But in

light of the setup of the current study, only a mean score was measured. The questionnaire contains question about intrinsic goals, task values, control of learning beliefs, self-efficacy, metacognitive self-regulation, and effort regulation.

According to the study by Shelton et al. (2019) the MSLQ proves to have an internal consistency rating ranging from .83 to .92. Furthermore, the MSLQ shows predictive validity when compared to the questionnaire outcome with the final attainable grade. However, the correlation has a modest value (Shelton et al., 2019).

Connor's Adult ADHD Rating Scale and Infrequency Index

Connor's Adult ADHD Rating Scale (CAARS) is a questionnaire used to measure a cross-section of symptoms and behaviors that are related to ADHD in adults (Erhardt & Sparrow, 1999). Different versions of the CAARS exist. There are short or long versions, and self-report or observer ratings. In the current study the CAARS-S:L was assessed, which is the self-report long form.

The CAARS-S:L consists of 66 items with nine subscales, which of four factor-derived subscales, three symptom measures according to the DSM-IV (APA, 1994), an ADHD Index and an Inconsistency Index subscale. To measure ADHD symptoms, the subscale CAARS DSM Total (based on the DSM-IV) is used. This measures the total amount of ADHD symptoms without differentiation between the inattentive or hyperactive-impulsive symptoms (APA, 1994).

The Inconsistency Index is constructed to evaluate inconsistency in responding to items that measure related content (e.g., 'I'm disorganized' and 'I'm absent-minded in daily activities'). The items are measured on a 4-point Likert-scale from (0 = Not at all, never; 1 = Just a little, once in a while; 2 = Pretty much, often, 3 = Very much, very frequently). The self-report forms were normed on a large sample of nonclinical adults (N=1.026) ranging from 18 to 72 years old.

The CAARS-S:L has shown to be a valid measure of ADHD symptoms. According to Erhardt & Sparrow (1999) the test met the criteria for good fit, and the intercorrelations of the subscales provided support for the multidimensionality of the CAARS. Both indicate factorial validity. The four factor-derived subscales and the ADHD Index were assessed for discriminant validity with both showing satisfactory results (the former 85% overall correct classification and the latter 73% overall correct classification) (Erhardt & Sparrow, 1999). Lastly the construct validity was evaluated by looking at the relationship between childhood and current symptoms and between self-report and observer ratings. Both cases support the argument that the CAARS has a good construct validity (Erhardt & Sparrow, 1999). For the population that is researched this DSM-IV Total scale is an appropriate scale, because Lefler et al. (2021) found that a unidimensional model (instead of a two or three factor model, which separates hyperactivity, impulsivity, and attention) would be best suited for assessing college students.

The CAARS-S:L does not include a measure to assess noncredible self-report. The included Inconstancy Index only measures inconsistency in responding to items that measure the same content. An Infrequency Index for CAARS (CII) was therefore designed by Suhr et al. (2010). According to their research it is not difficult for a motivated participant to identify the ADHD symptoms and to simulate having these, which makes it necessary for an additional instrument that measures this potential overreporting (Suhr et al., 2010). The constructed CII was found to have a good internal consistency with a Cronbach's Alpha of .86. Using a cutoff score of 20 was found to give the best results, being specific and relatively sensitive to an external criterion of validity, noncredible cognitive performance. The use of the CII adds fifteen items to the CAARS-S:L making it a questionnaire with a total of 81 items.

The reliability of the CAARS-S:L has proven to be good. The internal consistency of the subscales found in the original study by Erhardt & Sparrow (1999) gives support for this claim, ranging from .64 to .91. The mean inter-item correlations also provide support for the reliability ranging from .14 to .64 in the original study (Ehardt & Sparrow, 1999). Finally, the test-retest reliability for the CAARS-S:L was originally evaluated with 61 individuals, with an interval of one month. The results showed only significant correlations ranging from .80 to .91. Because the present study only assessed the questionnaire once, no test-retest reliability could be measured.

Self-Compassion Scale

Self-compassion was measured by the long version of the Self-Compassion-Scale (SCS) created by Neff (2003), which was developed by using an undergraduate sample with the average age of 21,3 years (N=71). The SCS is a self-report scale and consists of 26 items using a 5-point Likert-scale from 1 (Almost never) to 5 (Almost always). These 26-items are compartmentalized in six factors that measure self-kindness, self-judgment, common humanity, isolation, mindfulness, and over-identification. A confirmatory factor analysis (CFA) found an adequate fit to a six-factor structure. Additionally, the CFA found a marginal fit to a single higher order factor that could explain the inter correlations between subscales (Neff, 2003).

Further, the internal consistency for the 26-Items in the original study was found to be .92 (Neff, 2003). In addition, test-retest reliability of the SCS showed solely significant correlations ranging from .80 to .93 (Neff, 2003). Besides that, SCS could demonstrate internal reliability across different studies (e.g., Allen et al. 2012; Neff and Pommier 2013; Werner et al. 2012, as cited in Neff, 2016).

Moreover, the predictive validity could be demonstrated by investigating self-compassion as an independent variable on wellbeing (Neff, 2003). Furthermore, the SCS

encompasses a high group validity, as tested by comparing a sample of practicing Buddhist with a sample of undergraduate students. The group of Buddhists did score higher on self-compassion than the undergraduates (Neff, 2003). Additionally, the SCS shows a good discriminative validity to other self-attitude scales which tested for concepts of self-esteem and narcissism (Neff, 2003).

Procedure

The study was reviewed and approved by the Ethical Committee of Psychology at the University of Groningen (PSY-2021-S-0054), as a part of a Bachelor's Thesis project. Participants were recruited via the first-year practicum platform SONA, allowing participants to acquire course credits. Only those participants whose demographic information was collected, and whose ADHD symptoms were assessed with the CAARS-S:L (Erhardt, & Sparrow, 1999) in the previous studies "PSY-2122-S-0006 Parts 1 & 2" were eligible to participate in the current study. The participants signed the informed consent form, stating that they consent to participate in the current study; as well as accepting that it will be connected to the previous study they participated in.

Administration of the study happened digitally, via Qualtrics (https://www.qualtrics.com), participants were briefed about the study, then signed informed consent forms, and subsequently were able to begin the questionnaire parts of the study. Firstly, they completed the MSLQ, then the SCS, and thirdly they optionally, after consent, provided their grade on the course *Introduction to Psychology*/*Inleiding in de Psychologie* (PSBE1-01/PSBA1-01, respectively).

Before ending the survey, participants were asked to confirm whether they had answered seriously and honestly and whether they would allow us to use their data in our research. The ending screen saw them being instructed to click the red arrow in order to receive their SONA credits.

Statistical analysis

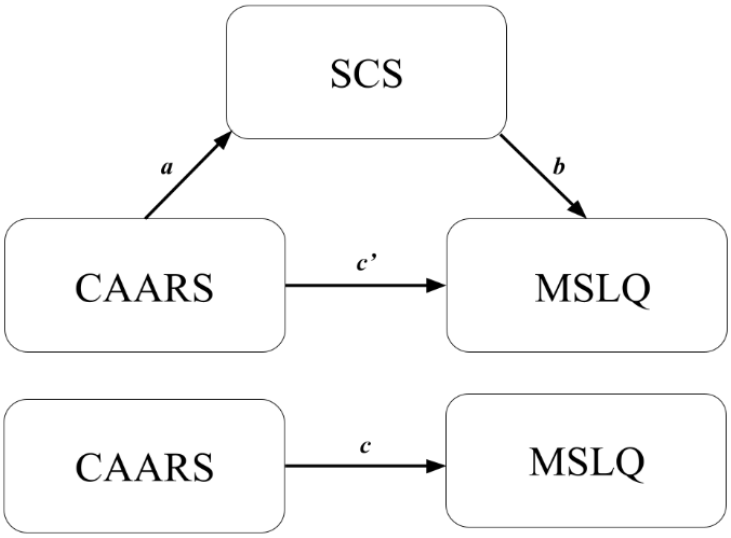
First, the assumptions for multiple linear regressions were checked by analyzing different plots visually. To check for normality, normal Q-Q plots were visually analyzed. To check for homoscedasticity and linearity, scatterplots of the distribution of residuals were visually analyzed. Also, multicollinearity was checked by analyzing the variance inflation factor (VIF).

For the statistical analysis, PROCESS Macro by Hayes (2013) was used. This is a computational add-on for SPSS. The hypotheses are illustrated by the paths in figure 1. This analysis produces all the coefficients and their statistical significance in SPSS. First, the output for the hypothesized negative relationship between the CAARS DSM Total and the MSLQ were assessed, by looking at the total effect. Second, the hypothesized negative relationship between the CAARS DSM Total and the SCS were assessed (direct effect). Third, the hypothesized positive relation between the SCS and the MSLQ were assessed by looking at the effect of SCS on MSLQ, while controlling for the CAARS DSM Total.

Afterwards the mediation and moderation model were explored. The mediation effect is determined by looking at the significance of the indirect effect of the CAARS DSM Total on the MSLQ through SCS, again using PROCESS Macro (Hayes, 2013). The moderation effect is determined by adding the interaction term (between CAARS DSM Total and SCS) to the model and investigating its significance (figure 2). Also, the R^2-change will be investigated, to see whether adding this interaction term adds significant value to the model. For this analysis, the SCS was reversed, so that the (hypothesized) correlations of both the CAARS DSM Total and SCS would be negative with the MSLQ. The hypothesis testing was done using a significance level (α) of .05.

Figure 1

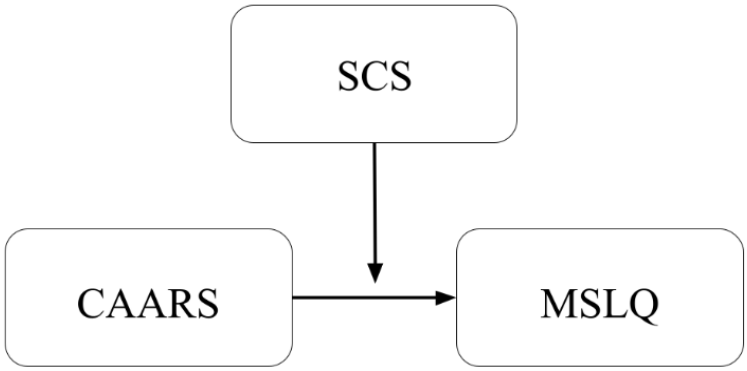
Mediation model



Note: *a* = Direct effect of CAARS on SCS, *b* = Effect of SCS on MSLQ, controlled for CAARS, *c'* = Direct effect of CAARS on MSLQ, *c* = Total effect of CAARS on MSLQ

Figure 2

Moderation model



Results

Descriptive Analysis

The data was first analyzed for the assumptions of regression. The residuals of the variables are equally distributed, according to visual inspection of the normal Q-Q plots (see appendix, figures 3-5). This finding shows no violation of the normality assumption. Another

visual inspection of the scatterplots shows an equal distribution of residuals around the zero (see appendix, figure 6 & 7). This finding shows no violation of the homoscedasticity and linearity assumptions. There also is no indication for the violation of the low multicollinearity assumption; the VIF was 1.075, with a tolerance of .930. For the independent variables, this is low enough (VIF < 5; Kutner et al., 2005).

Overall, our sample scored higher on the CAARS DSM Total scale (M = 19.43, SD = 9.85) than the normative group from (Erhardt & Sparrow, 1999). For women above the 80th percentile and for men above the 90th percentile (18 to 29 years old). For the SCS our sample scored average (M = 2.75, SD = 0.70). This was similar to the findings from the study by Willoughby & Evans (2019) (M = 2.63, SD = 0.63) For the MSLQ the current sample scored average (M = 5.25, SD = 0.65). Shelton et al. (2019) had found similar descriptive statistics in their study (M = 5.04, SD = 0.87).

A significant negative correlation was found between the CAARS DSM Total and the MSLQ (r = -.207, p = .004). The correlation between CAARS DSM Total and SCS was negative and significant (r = -.264, p < .001). The correlation between SCS and MSLQ was nonsignificant (r = .092, p = .118).

Main Analysis

To explore the mediation, first all separate paths (a, b, c, and c', figure 1) will be evaluated. These paths correspond with the hypotheses mentioned in the introduction. They are analyzed using the PROCESS Macro by Hayes (2013). To test the first hypothesis, whether there is a correlation between the CAARS DSM Total scale and MSLQ, the coefficient for path c (the *total effect*), was calculated. This showed a significant correlation (b = -0.014, se = 0.005, t(168) = -2.722, p = .007). This model explains 4.3% of the variance in MSLQ (R^2 = .043, F(166) = 7.410)

The second hypothesis, stating that there is a negative correlation between the CAARS DSM Total and the SCS, was tested (path a). A significant negative correlation was found (b = -0.019, se = 0.005, $t(168)$ = -3.522, $p < .001$). This model explains 7% of variance in SCS (R^2 = .070, $F(166)$ = 3.819).

The third hypothesis, stating that the SCS was positively correlated to MSLQ while the CAARS DSM Total is statistically controlled, was analyzed (path b). There was no statistically significant correlation found (b = 0.0373, se = 0.0731, $t(168)$ = 0.511, p = .610).

To explore if the mediation model is significant, path c' (the *direct effect*), was analyzed and compared to the total effect (*indirect effect*). The correlation for the direct effect of CAARS DSM Total on MSLQ was found to be significant (b = -0.013, se = 0.005, $t(168)$ = -2,485, p = .014). The indirect effect through SCS was found to be non-significant as indicated by the 95% confidence interval [-.0041;.0020]. These results provide no support for a mediation effect of the SCS.

Finally, a moderation model was tested. This model predicted 5.2% of the variance in the MSLQ mean scale and was significant (R^2 = 0.052, $F(164)$ = 1.833, p = .034). The interaction term between the independent variable CAARS DSM Total and SCS reversed was not a significant predictor (b = -0.008, $t(168)$ = -1.124, p = .263). Additionally, adding the interaction term made no significant difference in the explained variance of the MSLQ (R^2-*change* = .007, $F(164)$ = 1.263, p = .263). This means that there is no indication for a moderation effect.

Discussion

To answer the research question whether self-compassion mediates or moderates the relationship between ADHD symptoms and self-regulated learning strategies in college students, multiple analyses were conducted using three validated questionnaires. A negative relation was expected between ADHD symptoms and SRL strategies for the first hypothesis,

and this was found in the analysis. Shelton et al. (2019) previously found that the inattention symptoms of ADHD were negatively associated with all the subtypes of the MSLQ, and the current study (using a combination of inattention and hyperactive/impulsive symptoms) replicates these findings. However, the association is weaker in the current study. The second hypothesis expected a negative relation between ADHD symptoms and self-compassion, this was also found in the analysis. Willoughby & Evans (2019) found that their sample, consisting of people with ADHD or a learning disorder, had lower levels than other samples, suggesting a negative association. The present analysis also showed a significant negative relation between ADHD symptoms and self-compassion, supporting the hypothesis. The third hypothesis predicted a positive association between self-compassion and SRL strategies. Although this was not directly tested in previous studies, a positive relation was predictable. Interestingly, the results showed no significant relation between self-compassion and SRL strategies.

Additionally, two models which had not been tested before, were explored. First the mediation model, with self-compassion as the mediator was analyzed. This model was non-significant and thus did not support the hypothesis of a mediation effect. The second model was a moderation, with self-compassion as a moderator. This model was again non-significant and thus did not support the hypothesis of a moderating effect.

Overall, the relations that have been found were weak. The associations between ADHD symptoms and both other variables were replicated from previous research, and subsequently increased the robustness of these findings. However, the associations were less strong than previous studies suggest.

Theoretically this could mean that these relations are in fact less strong, or that the study differed too much. The former would indicate that students with more ADHD symptoms would not differ so much from students with less ADHD symptoms in experiencing

challenges with the use of SRL strategies. This seems unlikely as a good amount of previous research states students with ADHD do experience significantly more challenges in the use of SRL strategies and influencing their academic outcome (Shelton et al., 2019; Gomley et al., 2018; Reaser et al., 2007). An explanation for the latter could be the much higher proportions of participants that scored high on ADHD symptoms. This was a surprising finding in itself but could be explained by the fact that people with ADHD symptoms might be more interested in choosing the Psychology program to learn more about their own psychological challenges. These elevated scores could affect the analysis by diluting the strength of the observed associations, making them less pronounced when compared to previous studies with smaller proportions of participants exhibiting high ADHD symptoms. Another explanation for the weak relations could be that in the present study only means of full scales were assessed instead of the subscales. For example, Shelton et al. (2019) found a much stronger relation between the inattention subscale for ADHD and SRL strategies, while finding a weaker relation between the hyperactivity subscale and SRL strategies. Further research is therefore needed with the use of subscales, and it might be beneficial to study students from different programs.

A relation between self-compassion and SRL strategies was not directly tested in previous studies, although there were conceptual indications for a relation (Breines & Chen, 2012; Sirois, 2014). However, it was not found in the current study. Our findings could thus not support the hypothesis of a positive relation between self-compassion and SRL strategies. This might be because both the means of the SCS and the MSLQ might include too much information. Sirois (2014), for example, showed a relation between self-compassion and procrastination, indicating that self-compassion might just be related to the self-control part of SRL strategies. Again, future research needs to investigate these relations with the use of subscales. Additionally, the mediation and moderation analyses were explorative and showed

no significance. Because the current study is the first to test these models, they should be replicated in the future.

The current study had a replicative and explorative setup because these variables have not yet been studied together in a mediating or moderating analysis before. The goal of this was to find how these variables are related to one another. These insights are helpful for constructing interventions, in this case for students with ADHD who experience challenges with the use of SRL strategies. Although both mediating and moderating models were non-significant, the replicated bivariate relations were. This shows that self-compassion is a factor that might be of importance for constructing interventions for people with ADHD. While self-compassion might not be directly related to SRL strategies, previous studies did show a relation between self-compassion and motivation to improve oneself (Breines & Chen, 2012). Additionally, Dundas et al. (2017) have already studied interventions to increase self-compassion, which show promising results for healthy self-regulation. Further research is needed to build upon these previous findings and expand our knowledge of the effect of self-compassion in university students with ADHD understand this.

The current study has some strengths and weaknesses that should be addressed. Regarding the strengths, the sample size was adequate (n = 168). This makes the distribution of scores better, which is needed to represent more people with high and low scores. The final sample only included valid responses, due to thorough cleaning of infrequent and inconsistent responses. By only analyzing this final sample, the internal validity was optimized.

The reason to do this study was because there is still little research about the effect of ADHD symptoms on university students. This makes the current findings valuable to the body of research that is in need of expansion. Additionally, by replicating previous findings, this study improved the robustness of these findings, making them more reliable and useful in practical settings.

Another strength is that all the scales that were assessed came from validated questionnaires. Because these instruments have undergone rigorous validation, they ensure measuring what is intended. This enhances the validity and reliability of the current study. The use of these questionnaires is therefore encouraged in future research.

Regarding the limitations some points need to be addressed. This study is a self-report questionnaire, which means that some biases can affect the outcome. Because the students were questioned about their learning styles, they could (unconsciously) respond socially desirable, increasing their scores on the MSLQ. Also, because the sample consists of psychology students, their knowledge might influence their scores on the CAARS. Students who think they have ADHD (correctly or incorrectly) might subconsciously inflate their score on this scale by answering more extreme than they would without the knowledge. In this case a non-psychology or mixed sample might decrease this risk. Although it requires more from the researchers, an observational study regarding these variables might give a different and presumably more valid report. Additionally, because of the dimensional approach to ADHD symptoms instead of using a clinical sample, no statement can be made about students with an ADHD diagnosis.

Second, having only first year psychology students might affect the generalizability. The way students learn and feel self-compassion or use SRL strategies might differ per study year, but also per study program. Neff (2023) showed that self-compassion is not a fixed personality trait and might thus change over time. For our sample of psychology students, higher levels of SRL strategies are expected and stimulated because, compared to other programmes, it emphasized more on self-study. Programmes with more structured / practical courses might show different results. By studying these constructs within and between different samples, the generalizability increases which would give a more complete understanding of these constructs within students with more or less ADHD symptoms.

Another aspect that might be taken into account for future research is the way of measuring ADHD. For the current research, a total symptom scale was chosen, without differentiating between inattention and hyperactivity/impulsivity symptoms. Shelton et al. (2019) has found differences in correlations of these two types of symptoms with self-regulated learning. Making this differentiation may thus increase significant findings and give a more precise understanding. Also studying a clinical group diagnosed with ADHD could increase the reliability of findings, because they have undergone thorough assessment. This ensures that the groups being studied are more precise and have clearer distinctions.

Hilpert et al. (2013) had proposed the use of three factors of the MSLQ that were used in the current study: Expectancy, Value and Self-Regulation. Shelton et al. (2019) has found different relations between these subscales and ADHD, with inattention being higher related to SRL strategies. Future research might want to analyze self-regulation according to these subscales for a more precise conclusion. This might also be the case for the SCS. It could be interesting to look into the subscales of the SCS and their relation to different symptoms of ADHD and self-regulated learning.

Conclusion

The goal of this study was to broaden our understanding of the difficulties college students with ADHD are confronted with and their ability of using SRL strategies. First year psychology students were assessed in light of the question: Does self-compassion mediate or moderate the relationship between ADHD symptoms and self-regulated learning strategies in college students? As expected, ADHD symptoms were negatively associated with self-compassion and use of SRL strategies. Self-compassion was not positively associated with self-regulated learning strategies, indicating that college students with more self-compassion do not necessarily use more SRL strategies. No mediating effect, nor a moderating effect of self-compassion was found. Although the relations replicated previous studies, our

associations were found to be weaker. More research, such as observational or with the use of different subscales, is needed to broaden our understanding of ADHD in college students.

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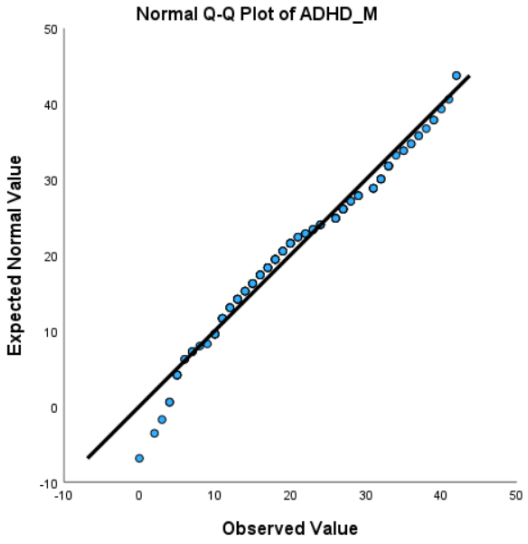
Appendix

Figure 3

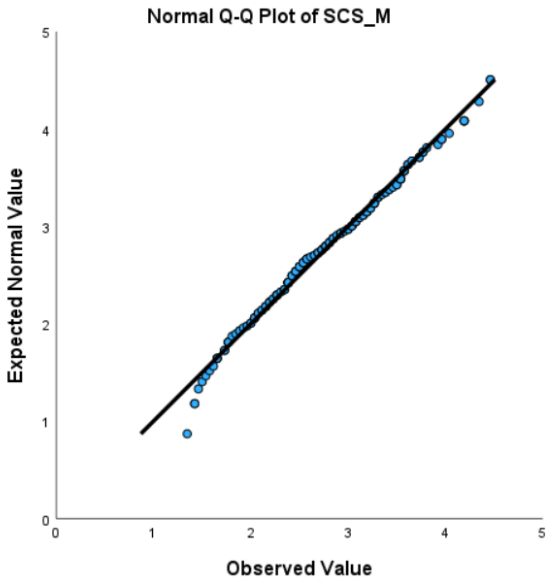
Normal Q-Q Plot of the residuals of the CAARS DSM Total scale



Note. This graph shows the distribution of the data of the CAARS DSM Total scale around the expected normal value line.

Figure 4

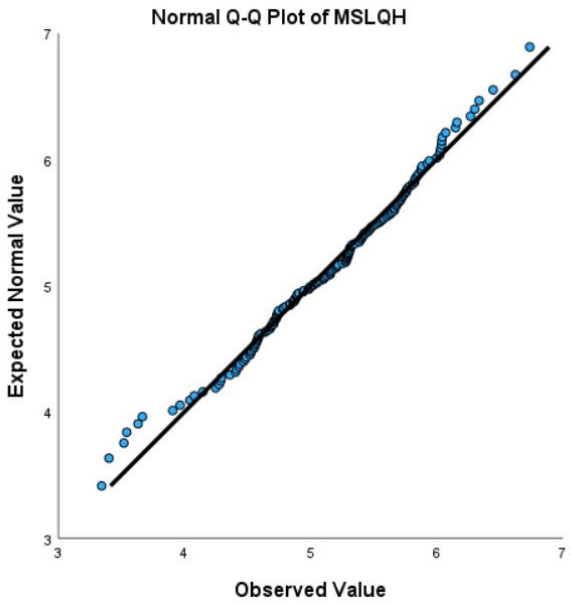
Normal Q-Q Plot of the residuals of the SCS



Note. This graph shows the distribution of the data of the SCS around the expected normal value line.

Figure 5

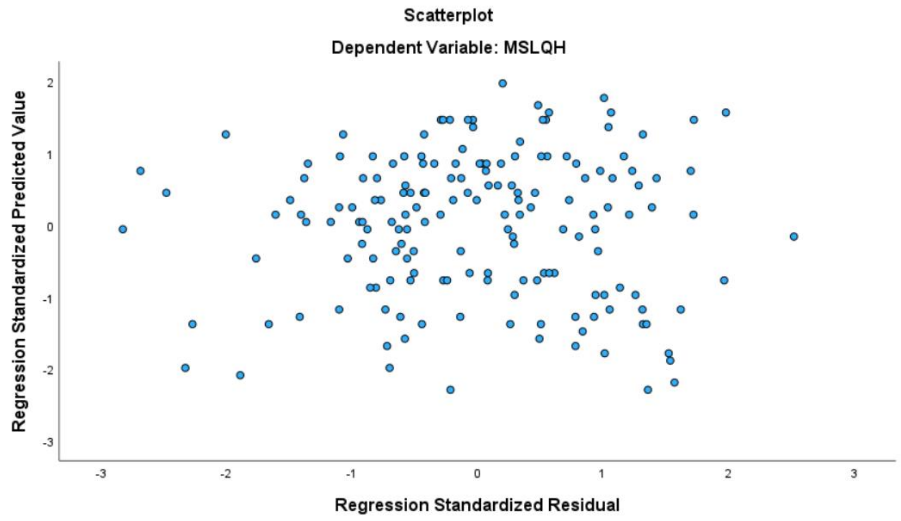
Normal Q-Q Plot of the residuals of the MSLQ



Note. This graph shows the distribution of the data of the MSLQ scale around the expected normal value line.

Figure 6

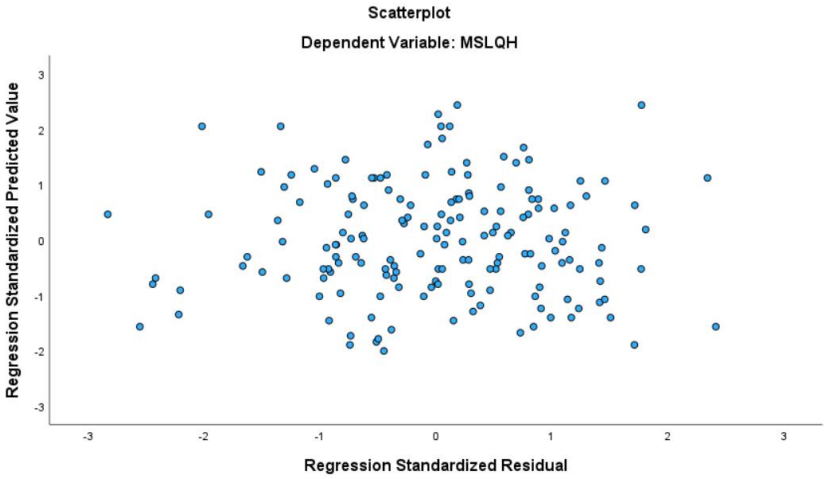
Scatterplot of the residuals of the predictor CAARS DSM Total scale with MSLQ as dependent variable.



Note. This scatterplot shows the distribution of the residuals of the CAARS DSM Total scale around the zero.

Figure 7

Scatterplot of the residuals of the predictor SCS with MSLQ as dependent variable.



Note. This scatterplot shows the distribution of the residuals of the SCS around the zero.