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The Relationship between Experiential Avoidance and Sleep Reduction: a Controlled Regression and Mediation analysis

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Abstract

Experiential avoidance (EA) is known to be a transdiagnostic factor in the development of numerous mental illnesses. Little is known however, about the relationship between EA and sleep. In this study we examined the relationship between EA and sleep reduction, when controlling for depressive symptoms, anxiety symptoms and perceived stress. Subsequently we looked at a possible mediation pathway where EA could be associated with sleep reduction through the aforementioned other variables. The participants (N = 86) consisted mostly of Dutch university students with a mean age of 20.4 years. Symptoms and traits were measured using the Brief Experiential Avoidance Questionnaire (BEAQ), the Beck Depression Inventory-IA (BDI-IA), the Revised Child Anxiety and Depression Scale (RCADS), the Perceived Stress Scale (PSS) and the Sleep Reduction Screening Questionnaire (SRSQ). A regression analysis was performed in SPSS, followed by a mediation analysis using the PROCESS plugin. The research reveals that there is a significant relationship between EA and sleep reduction (B = .18, R^2 = .169, p < .001), but this association becomes just non-significant when taking the other variables into account (B = .08, p = .051). Scores on the BDI-IA are the only significant mediator in this relationship (B = .06, p < .05). These results suggest that the effect of EA on sleep reduction is at least partially mediated by depressive symptoms. Additional research is needed to further examine this relationship and investigate possible clinical implications for the role of EA in sleep problems.

Samenvatting (Nederlands)

De transdiagnostische factor Experientiële Vermijding (EV) is betrokken bij de ontwikkeling van veel verschillende psychische stoornissen. Er is echter weinig bekend over de relatie tussen EV en slaap. In deze studie werd de relatie onderzocht tussen EV en slaap reductie, waarbij gecontroleerd werd voor de invloed van depressieve- en angst klachten en ervaren stress. Vervolgens werd er gekeken naar een mogelijk mediatie effect, waarbij EV geassocieerd zou kunnen worden met slaap reductie door invloed van de eerder genoemde variabelen. De participantengroep (N = 86) bestond voornamelijk uit Nederlandse universitaire studenten met een gemiddelde leeftijd van 20.4 jaar. Symptomen en eigenschappen werden gemeten door middel van de Brief Experiential Avoidance Questionnaire (BEAQ), de Beck Depression Inventory-IA (BDI-IA), de Revised Child Anxiety and Depression Scale (RCADS), de Perceived stress Scale (PSS) en de Sleep Reduction Screening Questionnaire (SRSQ). Een regressie analyse werd uitgevoerd in SPSS, gevolgd door een mediatie analyse met gebruik van de PROCESS plug-in. Het onderzoek wijst uit dat er een significante relatie is tussen EV en slaap reductie (B = .18, R^2 = .169, p < .001), maar deze significantie verdwijnt net aan als de andere variabelen in de regressie analyse worden meegenomen (B = .08, p = .051). Scores op de BDI-IA zijn de enige significante mediator in deze relatie (B = .06, p < .05). Deze resultaten suggereren dat het effect van EV op slaap reductie ten minste gedeeltelijk wordt gemedieerd door depressieve symptomen. Aanvullend onderzoek is nodig om deze relatie verder te onderzoeken en om te kijken naar mogelijke klinische implicaties van de rol van EV in slaap problemen.

Introduction

Experiential avoidance (EA) is defined as the unwillingness to stay in contact with unpleasant private experiences like physical sensations, emotions, thoughts and memories. A person therefore tries to alter the form or frequency of these negative experiences or the context in which they occur (Hayes, Wilson, Gifford, Folette & Srosahl, 1996). EA is a construct that is backed up by a lot of different theoretical schools of thought, including psychoanalytical views, Gestalt therapy and existential psychology (Gamez, Chmielewski, Kotov, Ruggero & Watson, 2011; Hayes et al., 1996). Furthermore, EA is a central theme within the third wave cognitive behavioural therapies, particularly acceptance and commitment therapy (Hayes, Luoma, Bond, Masuda & Lilis, 2006)

As EA encompasses avoidance and escape in all of their forms - as long as the behaviour shows methods of altering the character and frequency of experiences -, the array of behaviour that emerges from EA is very broad (Hayes et al., 1996). For example: avoiding certain places, conversations or thoughts that bring up unpleasant memories, using alcohol or drugs to avoid negative emotions, self-harm to reduce emotional arousal, social withdrawal, high-risk sexual behaviour, etc. (Chawla & Ostafin, 2007; Gamez et al., 2011). Interestingly, these avoidance behaviours often have the opposite effect of what the person tried to accomplish, as deliberate suppression of thoughts and emotions actually tends to heighten their importance (Hayes et al., 2006). Aside from being dysfunctional process, EA can also be quite debilitating. A person might have to increasingly avoid more and more experiences, further limiting their daily life. (Hayes et al., 1996).

Consequently, EA is linked to several negative outcomes such as lower psychological wellbeing and quality of life, higher stress levels, worse pain management and poor job performance. (Bardeen, Fergus & Orcutt, 2013; Biglan, Hayes & Pistorello, 2008; Hayes et al., 2006). Specifically, there is a growing set of analyses about EA being associated with a

variety of psychiatric illnesses. Hayes et al. (1996), when using EA as an example for a more transdiagnostic approach to psychopathology, already theorized the association between EA and substance abuse, obsessive-compulsive disorder, panic disorder with agoraphobia and borderline personality disorder. A review of Chawla and Ostafin (2007) examined this further, where they confirmed that experiential avoiders had a higher chance of substance abuse relapse and that EA was linked to symptom severity in generalized anxiety disorder and posttraumatic stress disorder. Furthermore, correlational studies have showed that EA was indeed associated with borderline personality disorders (Jacob, Ower & Buchholz, 2013) and depression and anxiety disorders (Bardeen et al., 2013; Kashdan, Barrios, Forsyth & Steger, 2006). A couple of longitudinal studies have also been performed, which indicated that EA is a predictor for anxiety and depression symptoms in both clinical and non-clinical samples (Kashdan et al., 2014; Spinhoven, Drost, de Rooij, Hemert & Penninx, 2014).

Rather new is the research on the association between experiential avoidance and sleep. There is some evidence that suppression and avoidance, in the context of emotion regulation, is associated with sleep problems (Palmer, Oosterhof, Bower, Kaplow & Alfano, 2018), but EA encompasses more than the emotional avoidance investigated in this research. A study among Japanese students (Kato, 2016) examined the relationship between EA, depressive symptoms and sleep difficulty. They deduced that EA correlated with depressive symptoms after controlling for the effect of sleep difficulty and, likewise, EA correlated with sleep difficulty after controlling for the effect of depressive symptoms. A study by Zakiei, Khazaie, Reshadat, Rezaei & Komasi (2020) examining experiential avoidance in patients with insomnia in comparison to a nonclinical sample, seemed to indicate that insomniacs scored significantly higher on experiential avoidance. Another study from the same university however, could not find a significant direct relationship between EA and sleep quality in either clinical insomniacs or healthy individuals (Khazaie, Zakiei, Rezaei, Hoseini &

Alikhani, 2017). A cross-sectional study by Warnke, Markarian & Pickett (2017) examined the relationship between EA and depression symptoms through perceived stress and reactivity, hypothesizing that EA increases perceived stress and stress reactivity, leading to higher pre-sleep arousal and therefore poorer sleep quality, resulting in more depression symptoms. According to their study, this could be the case. Lastly, a doctoral thesis by Li (2016) demonstrated that EA was significantly associated with sleep quality, not taking any possible confounders into account however. In conclusion, according to these studies, it seems that EA could indeed be linked to a variety of sleep problems. However, as most of these studies are small and correlational, a lot is still unknown about the details of this relationship.

As sleep difficulties are an extensive problem in many different countries (Léger, Poursain, Neubauer & Uchiyama, 2008), it can be beneficial to delve into possible attributes that play a role in the development and maintenance of sleep disorders. Extensive research has already showed that both depression and anxiety are interrelated with sleep problems in clinical and non-clinical samples (Alvaro, Roberts & Harris, 2013; Mason & Harvey, 2014; Spoormaker & van den Bout, 2005). Regarding the directionality of that relationship, longitudinal studies have shown that anxiety and depression act as a predictor in the development sleep problems, as well as that sleep problems can predict anxiety and depression at a later time (Baglioni et al., 2011; Bos, Carvalho, Macedo & Ferreira, 2019; Narmandakh, Roest, de Jonge & Oldehinkel, 2020; Pigeon, Bishop & Krueger, 2017). Another factor that is closely related to sleep problems is psychosocial stress. This seems to be the case in several cross-sectional studies (Åkerstedt, 2006), and a prospective study by Dewald, Meijer, Oort, Kerkhof & Bögels (2015) showed that higher stress levels have a negative effect on adolescents' sleep. As shown in the previous paragraph, perhaps EA could also be added to the list of factors that is related to sleep difficulties, just as EA is associated with a wide range of other mental problems.

What could be the underlying mechanism of such a relationship between EA and sleep problems? One could argue that, for example, sleep reduction leads to greater experimental avoidance. Former research has shown that less sleep is related to more negative emotions (Palmer & Alfano, 2017) and maladaptive emotion regulation strategies like suppression and emotional avoidance (Palmer et al., 2018). It could be possible that sleep reduction diminishes a person's capability to deal with negative experiences effectively. Furthermore, as sleep reduction might make negative emotions more frequent, one tends to avoid those negative experiences more often. A more likely possibility is that the tendency of avoiding leads to less sleep, regardless of subsequent mental health complaints like stress or depressive and anxiety symptoms. That is to say: one who avoids negative experiences, might be inclined to distract themselves from unfavourable feelings while in fact they should be sleeping. They may not be able to find rest as they do not have an effective way to deal with their problems. This course of action has also been discussed in the study of Warnke et al. (2017), and it seems more feasible, as EA generally seems to be a considered somewhat stable over time (Gamez et al. 2011) and previous research has defined EA as a predictor in several other mental disorders as well (Spinhoven et al., 2014).

In this study, we will further examine the relationship between EA and sleep problems. As opposed to previous research, we will not only be looking at the direct relationship between EA and sleep, but also if this association still exists when taking depression, anxiety and perceived stress into account, as these are factors that could both affect and be affected by EA and by sleep. If EA does appear to be associated with sleep problems, this could provide an incentive for further research into how that relationship works and into possible practical implementations of that knowledge. For example, ACT might be a viable therapy for experiential avoiders with sleep problems, if it becomes evident that these factors influence each other.

When performing this research, it's hypothesized that there is a positive correlation between experiential avoidance and sleep reduction when only looking at these two factors. This has also been shown in previous research. It will be interesting to see if this relationship will hold when controlling for anxiety and depression symptoms and perceived stress. Kato (2016) showed that, when controlling for depression alone, this relationship holds true. As previous research has also illustrated that EA is a transdiagnostic factor that leads to a broad variety of mental problems, it is likely that EA and sleep reduction will still be associated, even when taking the other variables into account.

It is also expected that a part of the effect of experiential avoidance on sleep reduction is mediated by anxiety and depression symptoms and perceived stress. This stands to reason as earlier research has shown that these factors are related with both EA and sleep. This mediation pathway also makes sense from a theoretical point of view: someone who scores high on experiential avoidance could develop mental health complaints that in turn negatively affect their sleep.

Method

Participants

To perform our research, we used data from a control group out of the StayFine study in the Netherlands. A total 100 people had been sent an invitation to participate, of which 86 people responded. The mean age was 20 years and 5 months, with a range from 17 years and 9 months to 24 years and 10 months (see Table 1). It's important to note that most of the participants (96,5%) were students, and the vast majority of the participants had parents born in The Netherlands. 18% reported having been given a psychiatric diagnosis in the past, of which Depression and ADHD was most frequent.

Table 1.

Demographic characteristics of participants (N = 86)

Variables	**N (%)**
Current education:	
- None	3 (3.5%)
- Higher Vocational Education	17 (19.8%)
- University	66 (76.7%)
Nationality Parents:	
- Dutch	81 (94.2%)
- Non-Dutch	5 (5.8%)
Past Psychiatric Diagnosis:	
- None	70 (81.4%)
- Depression	4 (4.7%)
- ADHD	4 (4.7%)
- PTSS	3 (3.5%)
- Anxiety disorder	1 (1.2%)
- Depression & Anxiety disorder	1 (1.2%)
- Other	3 (3.5%)
- Total psychiatric diagnoses	16 (18.6%)
Age in years:	
- Mean (±1SD)	20.4 ± 1.2
- Range	1.8 – 24.8

Measures

A list of questions was used to gather descriptive characteristics of the participants. Subsequently, several other self-report questionnaires were used to perform this research.

To measure Experiential avoidance, we used the Brief Experiential Avoidance Questionnaire (BEAQ; Gamez et al., 2014). This is a shortened version of the Multidimensional Experiential Avoidance Questionnaire (MEAQ). The BEAQ has 15 questions with a 6 point Likert scale each, resulting in one single score for EA ranging from 15 to 90. The questionnaire has shown good internal consistency with an alpha ranging from .80 to .89 (Gamez et al., 2014). Large studies on the test-retest reliability have yet to be performed, but two smaller analyses showed mixed results with a test-retest reliability of .70 and .45 on respectively the Spanish and Chinese version (Cao, Mak, Li & Leung, 2021; Vázquez-Morejón, Rubio, Rodríguez, Vázquez Morejón, 2019). In our sample, using a Dutch version of the BEAQ, the reliability was acceptable with a Cronbach's alpha of .73. According to Gamez et al. (2014), the BEAQ has approximately the same convergent and discriminant qualities as the MEAQ, and the construct validity of the MEAQ is known to be excellent (Rochefort, Baldwin & Chmielewski, 2018).

For the assessment of depressive symptoms, the Beck Depression Inventory-IA (BDI-IA; Beck & Steer, 1993) was used. This questionnaire consists of 21 items, evaluating how the participant was feeling in the past week with scores ranging from 0 to 3 per question, resulting in a score between 0 and 63. A study by Beck, Steer, Ball & Ranieri (1996) on the BDI-IA among psychiatric outpatients reported an alpha of .89, showing a high level of internal consistency. Two studies, one among students in Serbia and one among Chilean adults showed similar results (Ignjatovic-Ristic, Hinic & Jovic, 2012; Valdés et al. 2017). The study by Valdés et al. (2017) also showed good construct validity via factor analysis and

decent discriminant validity. Our study also showed a very good internal consistency, the Cronbach's alpha was .85 in our sample.

Anxiety symptoms were measured by use of the Anxiety Scale of the Revised Child Anxiety and Depression Scale (RCADS; Chorpita, Yim, Moffitt, Umemoto & Francis, 2000). This questionnaire exists of 31 items with 4 answer options each, resulting in a score ranging from 0 to 93. Among several studies on the RCADS version with 47 items, the mean alpha value of the Anxiety Scale is .93, but the versions with fewer items showed reduced reliability (Piqueras, Martín-Vivar, Sandin, San Luis & Pineda, 2017). The test-retest reliability is >.70 for all subscales except for OCD and the construct validity is good (Chorpita et al., 2000). A reliability analysis of the RCADS in our study showed excellent internal consistency, with a Cronbach's alpha of .90. Because the RCADS is made for children and teenagers, some items were adjusted a bit to also speak to an older population. For example, to any items that mentioned time at school, the addition 'or work' was included.

The Perceived Stress Scale (PSS; Cohen, Karmack & Mermelstein, 1983) was used to measure perceived stress. This 10 item questionnaire evaluates the extent to which a person feels like their life has been unpredictable, overburdened and uncontrollable in the past month, using a 5 point Likert scale each question. The result is a total score between 0 and 40. A review by Lee (2012) showed a mean alpha of .84 among 12 studies that used the shortened, 10 items version of the PSS. In the same study, the test-retest reliability was >.70 for the 4 studies that analysed this. In our sample, the reliability was good with a Cronbach's alpha of .81. According to Lee (2012), the criterion validity was not well researched, the results of the PSS were compared to several other questionnaires (for example the mental component of health status using the Medical Outcomes Study) and in most cases this validity was unsatisfactory, probably because it is unclear whether the used criteria were actual gold standards for the PSS.

Lastly, to measure sleep problems, we used the Sleep Reduction Screening Questionnaire (SRSQ; van Maanen et al., 2014) to assess symptoms of sleep reduction in the past two weeks. This 9 item questionnaire is used to quickly screen for possible sleep problems, albeit primary insomnia or sleep problems caused by other disorders like depression or somatic illnesses. The internal consistency of the SRSQ is decent, with an alpha of .79 for the general population and .77 for insomniacs. The test-retest reliability among Dutch high schoolers was .88, and the construct validity was good as it showed high correlations with self-reported sleep and daytime functioning as well as objectively measured sleep variables like sleep onset latency and sleep duration (van Maanen et al., 2014). A reliability analysis of the SRSQ in our study showed decent internal consistency, with a Cronbach's alpha of .78. As the mean age of the group used for development of the SRSQ was 15 years, like with the RCADS, some items were altered to also speak to an older population.

Procedure

The current study has a cross-sectional design using data from the Stayfine study in the Netherlands. This longitudinal study investigates the effectiveness of an app preventing relapse in adolescents up until 21 years old who have suffered from depression and/or anxiety in the past. We used data from the control group. For this control group, people were recruited via social media and by use of the SONA system, where students gain credit by participating in scientific studies. People were included if they were between the age of 13 and 25. If the participant had a depressive and/or anxiety disorder in the past, they were first approached to see if they had interest in joining the main study to prevent relapse. If not, they could still participate in the control group. Data collection for use in the main study and for master theses was approved by the Ethics Committee of Psychology at the University of Groningen

After inclusion, participants received an e-mail with additional information about the study and a link to the questionnaires. The participants filled out the questionnaires digitally on their own devices. They were notified that taking the tests would take 60 to 90 minutes and an informed consent form was integrated as the first page of the survey. Item non-response was avoided by only allowing the test taker to continue to the next questionnaire if they had filled in all of the items. They were however able to quit the questionnaire at any time, possibly leaving some of the tests unfilled.

Using the dataset, the total scores for each questionnaire were calculated. The data was then analyzed using SPSS and the PROCESS plugin version 3.5, created by Andrew F. Hayes.

Statistical Analysis

To carry out a regression analysis, we first checked the assumptions through visual inspection of the residual Q-Q plots and scatterplots and by checking that the variance inflation factor for each control variable was lower than 4. If assumptions were violated, the appropriate data transformation would be performed and the unprofitable variables would not be added to the model. If the assumptions were met, we would continue directly to the analysis. Significance levels for the analyses was set at $\alpha < .05$

We started with a simple linear regression analysis to check if there is a significant association between scores on the BEAQ and the SRSQ. After that, a multiple regression analysis was performed to test if the BEAQ still had a significant association with the SRSQ when scores of the BDI-IA, RCADS and PSS were also added to the model. The semi-partial correlation coefficient would then tell us how strong these relationships are.

Next, we performed a mediation analysis. This would be particularly interesting if the effect of the BEAQ on the SRSQ had decreased or even disappeared when adding the other

variables into the multiple regression model, as this would indicate a possible mediation effect. This is in line with the mediation analysis as suggested by Baron & Kenny (1986). To see if the mediation effect is significant, and which control variables are responsible for this mediation, bootstrapping was performed.

Results

Regression analysis

Firstly, the assumptions were examined by looking at the residual Q-Q plots, the scatterplots and the variance inflation factors when performing the two regression analyses. No assumptions were violated in both the simple linear regression between scores of the BEAQ and the SRSQ, and in the multiple linear regression where the BDI-IA, RCADS and PSS were added to the model.

Next, we looked at the relationship between experiential avoidance and sleep reduction, measured by the BEAQ and the SRSQ respectively. It was expected that these scores are positively and significantly associated with each other. Looking at the simple linear regression analysis, this was indeed the case. The BEAQ was a significant predictor for scores on the SRSQ (B = .18, $t(84)$ = 4.14, p <.001), with a moderate effect size (R^2 =.169, F (1, 84) = 17.13, p < .001).

Subsequently, we took the other variables into account. Descriptive statistics and correlations are presented in table 2. As predicted, both EA and sleep reduction were positively correlated with depressive symptoms, anxiety symptoms, and perceived stress. For EA, association was strongest with the depression score on the BDI-IA (r = .41, p < .001) and the sleep reduction score on the SRSQ (r = .41, p < .001). For sleep reduction, the correlation was strongest with the BDI-IA (r = .56, p < .001).

Table 2.

Mean, standard devation and correlation with other variables per questionnaire

	Mean (±1SD)	BEAQ	BDI-IA	RCADS	PSS	SRSQ
BEAQ	47.8 ± 9.0	-	.41***	.40***	.32**	.41***
BDI-IA	7.0 ± 6.3					
RCADS	23.7 ± 10.1					
PSS	16.5 ± 5.7					
SRSQ	15.7 ± 3.9	.41***	.56***	.43***	.52***	-

** p < .01 *** p < .001

A multiple linear regression analysis was performed with scores on the SRSQ (sleep reduction) as the dependent variable, scores on the BEAQ (experiential avoidance) as the independent variable and scores on the BDI-IA (depressive symptoms), RCADS (anxiety symptoms) and PSS (perceived stress) as control variables. Results of the analysis can be found in table 3. The expectation was that the BEAQ would still be significantly associated with the SRSQ when the other variables were added to the model. A significant regression equation was found (R^2 = .40, F(4,86) = 13.54, p < .001). The BDI-IA (B = .20, t(81) = 2.83, p < .01) and the PSS (B = .19, t(81) = 2.38, p < .05) were the only significant predictors for the SRSQ. In this model, the PSS explained 26% of the variance of the SRSQ, whereas the BDI-IA explained 24% of the variance. As for our hypothesis, EA as measured by the BEAQ almost reached significance (B = .08, t(81) = 1.98, p = .051). It would have explained another 17% of the variance of the SRSQ if it had reached said significance. Surprisingly, the association between the RCADS and the SRSQ disappeared altogether with the other variables in play.

Table 3.

Multiple linear regression model of the effect of the BEAQ on the SRSQ when controlling for the other variables

	B	SE	β	t	p	sr
BEAQ	.08	.04	.19	1.98	.051	.17
BDI-IA	.20	.07	.33	2.83	.006	.24
RCADS	-.007	.05	-.02	-.16	.877	-.01
PSS	.19	.08	.28	2.38	.020	.26

Mediation analysis

Because there was a significant relationship between the BEAQ and the SRSQ in the simple regression analysis, but not anymore when adding the other variables, mediation between the BEAQ and the SRSQ by the other variables is likely. To check if the mediation effect is significant, a parallel mediation analysis by means of the bootstrapping method was executed. Results of this procedure are presented in table 4. Consistent with the earlier regression analyses, the total effect of the BEAQ on the SRSQ was significant where the direct effect of BEAQ on SRSQ was not. When grouping all variables together, the mediation effect was significant (*B* = .10, 95% CI [.04 - .16]). The only significant mediator however, was the BDI-IA (*B* = .06, 95% CI [.01 - .12]). For further clarity, figure 1 shows the significant mediation effects indicated by standardized regression coefficients.

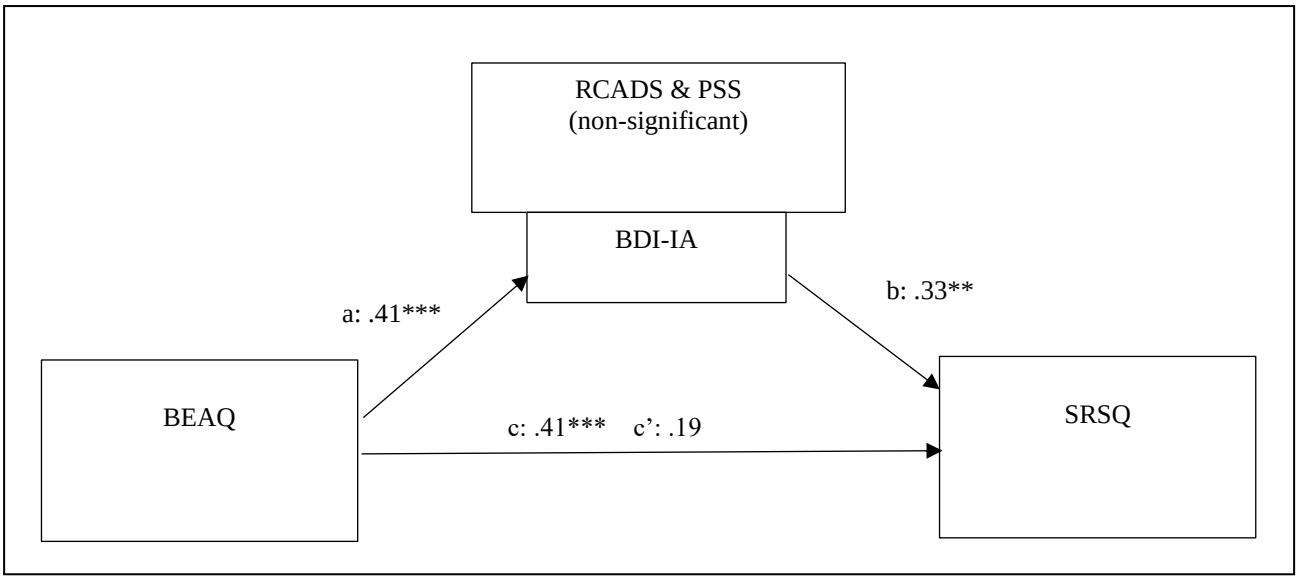
Table 4.

Mediation model of the effect of BEAQ on SRSQ with bootstrapping method

	B	95% CI of B	β	t	p
Total effect	.18	[.09 - .26]	.41	4.13	<.001
Direct effect	.08	[-.001 - .17]	.19	1.98	.051
Indirect effect:	.10	[.04 - .16]	.22	-	<.05
- **BDI-IA**	.06	[.01 - .12]	.14	-	<.05
- **RCADS**	-.003	[-.07 - .06]	-.008	-	>.05
- **PSS**	.04	[-.0001 - .09]	.09	-	>.05

Figure 1.

Standardized regression coefficients for BEAQ predicting SRSQ, mediated by BDI-IA, RCADS & PSS.



Note: the mediation models shows the total effect of BEAQ on SRSQ (path c) and the direct effect of BEAQ on SRSQ (path c'), as well as the total effect of BEAQ on BDI-IA (path a) and the effect of BDI-IA on SRSQ (path b). ** $p < .01$ *** $p < .001$

Discussion

This study hypothesized a relationship between EA and sleep reduction, even when controlling for depressive symptoms, anxiety symptoms and perceived stress. It was also expected that the relationship between EA and sleep reduction was partially mediated by the other variables. When looking at the effect of EA on sleep reduction in a simple regression analysis, there was indeed a significant association. When taking depression, anxiety and perceived stress into account, the effect of EA on sleep reduction nearly met the significance criterium, but it was not enough to reject our null hypothesis. Thus it appears that EA is not associated with sleep reduction when controlling for depressive and anxiety symptoms and perceived stress. Further mediation analysis on the effect of EA on sleep reduction indicated depressive symptoms as the only significant mediator.

Previous research has shown similar results when it comes to the relationship between EA and sleep in simple regression analyses. Kato (2016) demonstrated the association between EA and sleep difficulty. Li (2016) showed a significant relationship between EA and sleep quality and McCracken, Badinlou, Buhrman & Brocki (2021) also stated that EA correlated strongly with insomnia.

There is little research on the relationship between EA and sleep when controlling for as much variables as was done in our study. Kato (2016) has performed an analysis of similar design, using the same mediation method on students in Japan, taking only depressive symptoms into account. Their study showed similar correlations between EA, depressive symptoms and sleep difficulty. When controlling for depressive symptoms, EA stayed a significant predictor for sleep difficulties, in contrast to our research. Their effect of EA on sleep did decrease though, with a standardized coefficient of 0.394 reduced to 0.095 to 0.158. Our study showed a higher but nonsignificant standardized coefficient for the direct effect of

EA on sleep reduction. This could have to do with the fact that we used different questionnaires for EA and depressive symptoms, or that we had a slightly different outcome measure. Kato (2016) used the Sleep Difficulty Scale of the Sleep Quality Questionnaire, focused on sleeping troubles at night, where the SRSQ we used also had items addressing daytime sleepiness (Kato, 2014; van Maanen et al. 2014). A more likely explanation for the fact that our direct effect of EA on sleep was higher than in Kato's study (2016), but not significant, is that Kato had a much larger sample size (n = 633). Maybe the effect size of the direct effect of EA on sleep reduction was not large enough to demonstrate in our smaller sample. Furthermore, we also took perceived stress and anxiety symptoms into account. Although these variables were not significant as individual predictors, adding them to our model did in fact reduce the direct effect of EA on sleep reduction.

It's difficult to explain the disappearance of the effect of anxiety symptoms on sleep reduction in the multiple regression model, where the effect of depression symptoms and perceived stress on sleep reduction held. The RCADS had good internal consistency in this sample and there was no multicollinearity which could have made it difficult for the model to find the right coefficients. Ruling out these possible explanations, it seems that though anxiety symptoms are a significant predictor of sleep reduction on their own, they give no added information when depressive symptoms, perceived stress and EA are also predictors in this sample. A study by Zhang, Peters & Chen (2018) found a similar effect, where perceived stress fully mediated the association between sleep quality and anxiety symptoms in a sample of college nursing students. They also found that perceived stress only partially mediated the association between sleep quality and depressive symptoms, which is consistent with the fact that the relationship between depressive symptoms and sleep reduction did in fact prevail in our multiple regression analysis. Further research would be needed to look into this interesting phenomenon.

Our study has several strengths. It is one of the first studies to delve as extensively into the association between EA and sleep reduction, taking multiple control variables into account to fully understand this intricate relationship. Furthermore, the questionnaires we used in this study all have shown good internal consistency in our sample. Another advantage to our research is that, in contrast to other studies, we used the BEAQ to measure EA instead of the AAQ-II. The AAQ-II was developed as a measure of experiential avoidance or, as some studies call it, psychological inflexibility (Bond et al., 2011). An examination of the construct validity of AAQ-II by Rochefort et al. (2018) however, stated that this AAQ-II might actually be measuring negative emotionality or neuroticism more strongly than that it's measuring EA. This calls for caution when interpreting the scores of the AAQ-II. The BEAQ does not have this problem with discriminant validity, making it a more suitable questionnaire for this research.

The other questionnaires used in this study though, do have their limitations. The BDI-IA is an old questionnaire based on the DSM-III, and does not fully represent depression symptoms as we understand them present-day. For example, the questionnaire does not inquire about concentration and agitation, and though it does ask about decrease in appetite and sleep, it doesn't ask about increase in these symptoms (Beck et al., 1996). It's possible that, had agitation also been included in the questionnaire, the BDI-IA would have correlated more strongly with sleep reduction, whereas including sleep increase probably would have reduced the association between the depressive symptoms and sleep reduction. Most importantly however, the questionnaire asks for symptoms in the last week, as opposed to two weeks which would be consistent with the minimal duration of depression according to the DSM-V (American Psychiatric Association, 2013). This shortened time period might bring the risk of measuring an emotional state more than that it measures a depressive episode. Fortuitously, the BDI-IA does correlate with the BDI-II quite strongly (r = .93) (Dozois,

Dobson & Ahnberg, 1998), so it's expected that the use of the old questionnaire did not convolute our results too much. Nevertheless, in the future it would be wise to use the newer questionnaire, as the BDI-II is also widely researched and has excellent psychometric properties (Wang & Gorenstein, 2013)

The RCADS used in this study is a questionnaire meant for the ages between 8 and 18 years old, a population undoubtedly different from the participants in our study. There is a great deal of overlap in the clinical presentation of anxiety symptoms in adults and children, but there are developmental differences (Spence, 1998; American Psychiatric Association, 2013). For example, separation anxiety in young children often presents itself as a refusal to go to school or not wanting to sleep separately, whereas adults can have difficulty moving out and can also get afraid of being separated from their own children or partner (van der Sluis & Möller, 2016). A study by McKenzie, Murray, Freeston, Whelan & Rodgers (2019) examined the validity of the RCADS in adults, and it appeared to be a reliable measure, at least for general anxiety as opposed to the specific subscales. As we did not use any specific subscale, and adjusted some of the questions to be more fitting for adults, just like McKenzie et al., this indicates that the results from our RCADS might indeed be seen as a reliable measure for anxiety. Questions about separation anxiety however, did not get adjusted to also represent the different clinical presentation of adults. Therefore it's possible that separation anxiety is underrepresented in our sample, leading to a tempered association between the RCADS and the SRSQ. It's also important to mention that we did not include the OCD subscale in the calculation for our total anxiety scale. This does have some theoretical backing by the fact that the DSM-V does not classify OCD as an anxiety disorder (American Psychiatric Association, 2013), but there is no previous research about the external validity of the anxiety scale in this configuration. Specific phobias are also not included in the RCADS. Fortunately, OCD and specific phobias are not as much associated with sleep problems as compared to

other anxiety disorders, (Ramsawh, Stein, Belik, Jacobi & Sareen, 2009), so they will probably not affect our results as much.

Lastly, the SRSQ is also designed with adolescents in mind, using a sample with the mean age of about 15 years old during development. It is unclear whether or not this translates well to our sample of young adults, but to forestall possible influence, some items were tweaked to also adhere to an older audience. Furthermore, the SRSQ does not specifically screen for insomnia symptoms or other specific sleep problems, but rather scans for the more general manifestation of sleep reduction, indicating when further examination is needed. These symptoms of sleep reduction might be due to a sleeping disorder, but also caused by disorders as depression or somatic illnesses (van Maanen et al., 2014). Then again, this is also the case for other sleep questionnaires, like the Pittsburgh Sleep Quality Index (Buysse, Reynolds, Monk, Berman & Kupfer, 1989) and the Sleep Quality Questionnaire (Kato, 2014). In the future, it might be interesting to look at specific sleep disorders like insomnia, as this could give more possibilities for practical implementation of obtained knowledge.

In addition to these questionnaire difficulties, the cross-sectional design of this study has it's restraints. The mediation analysis was built on the theory that EA is a stable trait that could result in sleep problems, but it's impossible to determine causality in the current study. Furthermore, all measurements where done using self-report questionnaires, making room for self-report bias. Ideally, one would combine different assessment tools to get an as accurate picture as possible, as is recommended for depressive symptoms and sleep assessment (Cuijpers, Li, Hofmann & Andersson, 2010; Ibáñez, Silva & Cauli, 2018). It's also important to realize that our sample consisted for the grand majority of students with nonimmigrant parents, possibly limiting the generalizability of our results.

To summarize: although the current study presents its limitations, it does tell us more about EA and it's relation to sleep problems. Much of the association between EA and sleep reduction is mediated by other mental problems, mainly depressive symptoms. This tells us something about the inner workings of EA as a transdiagnostic factor. As the direct effect of EA on sleep reduction very nearly hit significance in our sample, it's difficult to make any definitive statement about this result. Further research would be needed in a larger sample to fully understand the delicacy of both the direct and indirect effects of EA. Research using a clinical sample could tell us if the relationship between EA and sleep reduction gives implications for treatment, but to imply that therapy targeting experiential avoidance, like acceptance and commitment therapy might be a viable treatment option for sleep problems would be premature.

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