The Potential Buffering Role of Psychological Flexibility and Trait Self-Control against Somatic Symptoms and Poor Physical and Mental Health

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Publicly accessible: Yes
Date: 18-06-2018
Words: 8011

Abstract

People with somatic symptoms and poor health tend to adopt a lifestyle of disability, because they avoid symptom-inducing activities. Both principles of cognitive-behavioural therapy and acceptance and commitment therapy are commonly used to manage somatic symptoms and poor health. Two skills that can be considered prototypical for these therapies are trait self-control and psychological flexibility. The aim of this cross-sectional study was to get insight into the potential buffering role of trait self-control and psychological flexibility against somatic symptoms and poor physical and mental health. The participants (n = 318, 71% female, mean age 44) completed the online questionnaire that included the Flexibility Index Test (FIT-60), Brief Self-Control Scale (BSCS), Patient Health Questionnaire-15 (PHQ-15) and the RAND Short Form 36 (SF-36). People with higher psychological flexibility had fewer somatic symptoms (t = -8.13, p < .001), better physical health (t = 4.87, p < .001) and better mental health (t = 17.48, p < .001). People with higher trait self-control had better physical health (t = 2.40, p = .02). The combination of both higher psychological flexibility and higher trait self-control was not associated with somatic symptoms (t = 0.79, p = .43), physical health (t = -0.71, p = .48) and mental health (t = 0.94, p = .35). The findings suggest that it would be valuable to get insight into the causality of the associations, by testing interventions aimed at decreasing somatic symptoms and increasing physical and mental health with psychological flexibility and self-control.

Keywords Psychological Flexibility; Trait Self-Control; Somatic Symptoms; Physical Health; Mental Health; Acceptance and Commitment Therapy

Introduction

In 2016 on average 13.4% of the people above age 12 in The Netherlands were hindered by pain (Centraal Bureau voor de Statistiek [CBS], 2016). Pain is just one of the many somatic symptoms that people can suffer from. Psychosocial factors seem to play a key role in dealing with somatic symptoms and poor health (Eccleston, 2001). To elaborate on this, the symptom pain will be used as an example. Research findings suggest that psychological factors predict pain-associated disability (Eccleston, 2001). Research of Aldrich, Eccleston, and Crombez (2000) states that fear of pain is a normal response to deal with pain. Due to this fear of pain, people can be inclined to avoid physical activities. In turn, this forces them to adopt a lifestyle of disability. It is even stated that fear of pain is more disabling than pain itself (Aldrich et al., 2000; Eccleston, 2001). The effect of the fear of pain in one's daily live is profound, as people start to avoid pain-inducing activities. This avoiding behaviour seems to cause fatigue, a reduction in value-based living and a narrowed behavioural repertoire (Densham, Williams, Johnson, & Turner-Cobb, 2016). Because of this, it is important to understand how people can deal differently with somatic symptoms and poor physical and mental health. The current study focuses on skills that may help people to deal with this.

Currently, there are two main approaches in managing somatic symptoms and poor physical and mental health (Cameron, Kool, Estévez-López, López-Chicheri, & Geenen, 2018). The first is the classical cognitive behavioural therapy (CBT). The second is acceptance and commitment therapy (ACT). CBT aims at developing coping skills, changing dysfunctional thoughts into helpful thoughts and promoting helpful behaviour, by for example graded exercise. ACT aims at improving the six core processes of psychological flexibility as specified in a hexaflex model, namely: acceptance, cognitive defusion, present moment, observing the self, values and committed action (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Two skills that can be considered prototypical for CBT and ACT, respectively, are self-control and psychological flexibility. These two skills may trigger an improved ability to deal with somatic symptoms and poor physical and mental health.

The first skill, self-control, is the capacity to adapt the self in order to create a better fit with norms, values and social expectations (Tangney, Baumeister, & Boone, 2004). Self-control is called one of the most powerful and beneficial adaptations of humans, because people feel happiest and healthiest when there is an optimal fit with the world. Higher self-control is associated with better well-being in life (Tangney et al., 2004). In the strength model of self-control, self-control is explained as a protective factor and a psychological resource (Baumeister, Vohs, & Tice, 2007). This model proposes that self-control functions as

a muscle and that self-control can be depleted, just as a muscle gets tired. Some people seem to have a stronger muscle or a muscle that is resistant to fatigue, which means that they possess a more stable form of self-control (Friese, Frankenbach, Job, & Loschelder, 2017). This form of self-control is called trait self-control. It is crucial for people, as it shows either the chronic vulnerability for problems or the chronic buffer against problems (Friese & Hofmann, 2009). The discounting model of impulsiveness explains this by stating that people with higher trait self-control are better able to choose for a delayed, more valued outcome, over a short-term outcome that is ultimately of less value (De Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012). This may help people to be committed to change their avoidance behaviour and suppress the impulse to not participate in activities of daily life. People with higher trait self-control are better able to psychologically adjust to situations, control thoughts and emotions (Tangney et al., 2004). This may be helpful with changing dysfunctional thoughts about somatic symptoms and health. Trait self-control has an important role in the protection and promotion of physical and mental health (Park, Park, & Kim, 2017). Based on these theoretical considerations and empirical findings, it is argued that trait self-control might act as a buffer against somatic symptoms and poor physical and mental health.

The second skill, psychological flexibility, entails the ability to accept the wanted and unwanted experiences in the present moment (Densham et al., 2016). Psychological flexibility is targeted in ACT. By enhancing the six core processes of ACT, psychological flexibility can be established (Hayes et al., 2006). A theory, on which ACT is build, is the psychological flexibility model (McCracken & Morley, 2014). This model states that the content, form and intensity of experiences are not sufficient in explaining behaviour. Behaviour is based on the function of these experiences in the given context. This means that genetic, cultural and the individual learning history influence the behaviour in a specific context. People with poor health may be avoiding the symptoms in specific situations, because they have learned to handle it that way. Whereas in other contexts someone might be more open towards the symptoms, for example when they have learned to be accepting towards the symptoms. People with higher psychological flexibility may be better able to experience and accept the symptoms, without wanting to avoid them. This is associated with better health and functioning (Scott, Daly, Yu, & McCracken, 2017). A study from McCracken and Zhao-O'Brain (2010) showed that people with higher psychological flexibility experience less pain-related problems. These findings are supported by Reneman, et al. (2014), because they too found a negative association between psychological flexibility and somatic symptoms.

Furthermore, ACT seems to be effective in decreasing pain intensity and disability (Powers, Vörding, & Emmelkamp, 2009). From the associations that have been found and the theoretical considerations, it is argued that psychological flexibility may act as a buffer against somatic symptoms and poor physical and mental health.

Both trait self-control and psychological flexibility separately may have a buffering effect for dealing with somatic symptoms and poor health. People with a larger repertoire of abilities are expected to deal even better with health issues (Vriezekolk et al., 2012). This may implicate that the combination of higher trait self-control and higher psychological flexibility can reinforce the buffering effect. Higher trait self-control will protect people from giving in to the pain experience and it will make them able to control thoughts and emotions when needed. Higher psychological flexibility will make people open and accepting towards the experience of pain, which is beneficial when situations are harder to control.

The aim of this study is to examine the association of trait self-control and psychological flexibility with the level of somatic symptoms and physical and mental health. The main research question is: *To what extent are trait self-control and psychological flexibility significantly associated with somatic symptoms, physical health and mental health?* In order to get insight into this, three sub-questions will be examined. The first sub-question is: Do people with higher psychological flexibility, and its six components, report fewer somatic symptoms and better physical and mental health than people with lower psychological flexibility? The second sub-question is: Do people with higher trait self-control report fewer somatic symptoms and better physical and mental health than people with lower trait self-control? The third sub-question is: Is the interaction of psychological flexibility and trait self-control associated with somatic symptoms, physical health and mental health?

Based on the theoretical framework that has been discussed, it is hypothesised that people with higher psychological flexibility, and its six components, report fewer somatic symptoms and better physical and mental health. It is also hypothesised that higher trait self-control is associated with fewer somatic symptoms and better physical and mental health. Both because of the buffering functions that higher psychological flexibility and higher trait self-control seem to have. A last expectation is that there is a significant interaction of psychological flexibility and trait self-control. This interaction reflects that particularly the combination of high psychological flexibility and high trait self-control is related to lower scores on somatic symptoms and higher scores on physical and mental health. An overview of the literature search and used articles for the theoretical framework can be found in the appendix.

Methods

Procedure and participants

The study was approved by the ethics committee of the faculty of social and behavioural sciences of Utrecht University. The study was part of a research project together with prof. Rinie Geenen, junior researcher Tim Koppert and three other Master's students from Utrecht University. The questionnaires were entered into LimeSurvey to create an online survey. Participants were invited to take part in the online survey via several routes. First of all, recruitment was done via personal messages to family, friends and acquaintances of the researchers participating in the research project. In turn, these people were asked to recruit people in their social environment. Secondly, participants were recruited via messages on social media, like Facebook, LinkedIn and Twitter. To get enough patients with somatic symptoms, participants were also recruited via social media of patient associations. The message that was used to recruit people included information about the aim and content of the study, the inclusion criteria, duration of the survey, confidentiality and a hyperlink to the online survey. Participants could decide to fill in the online survey after receiving the recruitment message and having given informed consent. The participants voluntarily participated in the study and were not rewarded for their participation. While taking the survey, participants were free to stop at any point if they chose to do so.

The study had inclusion criteria. The first one was that all participants had to be 18 years or older. The second one was that only the participants were included who filled in at least the questionnaires that provided scores on psychological flexibility, trait self-control and one health status outcome. This way all participants could be included in at least one of the analyses. All participants that filled in fewer questionnaires were excluded from the study.

From the 567 people that started the survey, 133 were excluded, since they did not answer any of the questions. Another 114 people were excluded, because they filled in fewer questionnaires than the minimum that was set. Two participants were excluded for answering a question with 'other'. After the exclusion of these participants, a total of 318 participants were included in the current study. Not all 318 participants filled in the last questionnaire from the survey. Because of this, there were only 314 participants in the hierarchical regression analysis with the outcome variable physical health and 315 participants in the hierarchical regression analysis with the outcome variable mental health. For all other analyses the total of 318 participants were used. The total of 318 participants consisted of many women (n = 227) compared to men (n = 91). The average age was 43.78 (SD = 1.43)

with a range from age 18 to 78. Participants had high education (n = 255) or other education (n = 63).

Design

In this study a between subjects, cross-sectional research design was used. The variables in the analyses were psychological flexibility, acceptance, cognitive defusion, observing the self, present moment, values, committed action, trait self-control, somatic symptoms, physical health and mental health.

Material

Demographics. Various demographic characteristics were measure. Next to the usual questions about gender, age and education, there were questions about work, relationship and chronic physical diseases. Education was divided into two categories: High education (including university of applied sciences [‘*hoger beroepsonderwijs*’] and university [‘*wetenschappelijk onderwijs*’]) and other education.

Psychological flexibility. The Flexibility Index Test (FIT-60; Batink, Jansen, & de Mey, 2012) was used to measure psychological flexibility. Examples of questions from this questionnaire are: Worries are in the way of my success [‘*Zorgen staan mijn succes in de weg*’], I am willing to fully accept my fear [‘*Ik ben bereid om mijn angst volledig toe te laten*’] and I think I do not have to do everything right [‘*Ik hoef dingen niet altijd goed te doen van mezelf*’]. In the original questionnaire, the questions are answered on a 7-point Likert scale. However, due to a mistake by one of the researchers with entering the questionnaire online, the questions were answered on a 5-point Likert scale in this study. The Likert scale ranged from completely disagree [‘*Helemaal oneens*’] (1) to completely agree [‘*Helemaal eens*’] (5). A higher score on the FIT-60 means higher psychological flexibility. The internal consistency for the complete FIT-60 was high (α = .94) and the internal consistency for the six subscales varied from acceptable to high (Acceptance; α = .84, Cognitive defusion; α = .89, Observing the self; α = .60, Present moment; α = .80, Values; α = .72, Committed action; α = .80). Previous research has shown that the validity of the FIT-60 is satisfactory (Batink et al., 2012).

Self-control. The Brief Self-Control Scale (BSCS; Tangney et al., 2004) was used to measure trait self-control. Example questions are: I am good at resisting temptation [‘*Ik kan verleidingen goed weerstaan*’], I do certain things that are bad for me, if they are fun [‘*Ik doe wel eens dingen die slecht voor me zijn als ze leuk zijn*’] and I am able to work effectively

toward long-term goals [‘*Ik kan goed werken aan lange termijn doelen*’]. The items were answered on a 5-point Likert scale. The Likert scale ranged from not at all [‘*Helemaal niet op mij van toepassing*’] (1) to very much [‘*Heel erg op mij van toepassing*’] (5). A higher score on the BSCS means higher trait self-control. The internal consistency in this study was good (α = .81). Previous research has shown that the BSCS has good validity (Tangney et al., 2004).

Somatic symptoms. Somatic symptoms were measured with the Patient Health Questionnaire-15 (PHQ-15; Kroenke, Spitzer, & Williams, 2002). The main question in this questionnaire is: During the past four weeks, how often have you suffered from one of the following problems? [‘*Gedurende de voorbije 4 weken, hoe vaak heb je last gehad van een van de volgende problemen?*’]. Examples of problems that were asked about were: stomach pain [‘*Buikpijn*’], dizziness [‘*Duizeligheid*’] and feeling tired or having low energy [‘*Gevoel van vermoeidheid of weinig energie*’]. The items were answered on a 3-point scale ranging from not bothered at all [‘*Helemaal geen last*’] (0) to bothered a lot [‘*Veel last*’] (2). A higher score on the PHQ-15 means the occurrence of more somatic symptoms. The internal consistency in this study was adequate (α = .78). Previous research has shown that the validity of the PHQ-15 is acceptable (Kroenke et al., 2002).

Physical and mental health. The RAND Short Form 36 (SF-36; Vander Zee, Sanderman, Heyink, & de Haes, 1996) was used to measure the degree of health on two domains ‘physical health’ and ‘mental health’. An example item is: What do you generally think of your health? [‘*Wat vindt u, over het algemeen genomen, van uw gezondheid?*’], The next questions are about daily activities. Are you currently limited by your health at these activities? If yes, to what extent? [‘*De volgende vragen gaan over dagelijkse bezigheden. Wordt u door uw gezondheid op dit moment beperkt bij deze bezigheden? Zo ja, in welke mate?*’] and How much bodily pain have you had during the past 4 weeks?, [‘*Hoeveel pijn had u de afgelopen 4 weken?*’]. The items were answered on different scales varying from ‘Yes’/’No’ questions to a 6-point Likert scale ranging from constantly [‘*Voortdurend*’] (1) to never [‘*Nooit*’] (6). A higher score on the SF-36 means a better physical or mental health. Physical and mental health composite scores were computed based on the method of Hays, Sherbourne, and Mazel (1993). The internal consistency in this study for the SF-36 was good (α = .86), as well as for the physical health (α = .85) and mental health (α = .83) domains. Previous research has shown that the SF-36 has high validity (Vander Zee et al., 1996).

Other questionnaires. The participants also filled in the Big Five Inventory-2 (BFI-2; Soto & John, 2017) and the Scale of Body Connection (SBC; Price & Thompson, 2007). These questionnaires were used in studies by fellow Master's students, not in this study.

Data and analysis

The statistical analyses were done with Statistical Package for Social Sciences (SPSS version 25.0). Significance levels were set at $p < .05$, $p < .01$ and $p < .001$ (two-tailed). All the assumptions for the analyses were met. The score distributions of all variables were checked, by looking at the skewness, kurtosis and histograms. All variables had skewnesses between -1 and 1 and the histograms showed a normal distribution of scores.

Pearson correlations were computed to examine the univariate associations of trait self-control, psychological flexibility and its six components with somatic symptoms, physical health and mental health. Multivariate hierarchical regression analyses were performed to examine whether trait self-control, psychological flexibility and the interaction of trait self-control and psychological flexibility were associated with somatic symptoms, physical health and mental health. Age, education and gender were also included in the hierarchical regression analyses to control for these variables. In Block 1, the demographic variables age, education and gender were entered. In Block 2, centred scores of psychological flexibility and trait self-control were entered. In Block 3, the interaction of psychological flexibility and trait self-control was entered. To interpret the interactions, regression lines for individuals with low (-1 *SD*) and high (+1 *SD*) levels of psychological flexibility were plotted for low (-1 *SD*) and high (+1 *SD*) levels of trait self-control. The regression equations provided insight into the nature of the moderation.

Post hoc analyses were done to provide further insight into the associations of the six components of psychological flexibility with somatic symptoms, physical health and mental health. Hierarchical regression analyses were done, as explained above, with psychological flexibility being replaced with one component of psychological flexibility at the time. Furthermore, every component of psychological flexibility was divided into tertiles. This means that three groups with low, middle and high scores were created for every component. The mean scores for the low, middle and high groups are shown in table 1. Bonferroni post hoc test were carried out to examine how these three groups score relative to each other on every component. Cohen's *d* effect sizes were calculated for significant differences between groups.

Table 1

Mean Scores (M) for the Low, Middle and High Tertile Groups from the Six Components of Psychological Flexibility

Group	Somatic symptoms	Physical health	Mental health
Acceptance			
Low	9.13	43.65	39.14
Middle	6.39	49.12	48.52
High	5.97	48.85	52.86
Cognitive defusion			
Low	8.96	45.27	38.81
Middle	5.85	48.99	49.10
High	6.56	47.88	52.55
Observing the self			
Low	8.56	44.39	40.28
Middle	5.93	49.59	49.95
High	7.39	47.48	49.97
Present moment			
Low	9.03	44.23	40.37
Middle	6.42	48.28	47.63
High	6.35	49.01	52.94
Values			
Low	8.43	43.81	41.39
Middle	7.66	47.13	46.95
High	6.00	52.45	54.18
Committed action			
Low	8.20	44.16	42.00
Middle	7.41	49.72	49.79
High	5.25	51.26	50.84

Results

The characteristics of the scores on the variables used in the analyses are shown in table 2. The average score on the PHQ-15 fell in the range of a low level of somatic symptoms (Kroenke et al., 2002). The average scores on physical and mental health were relatively close to the average of 50 of the general population (Vander Zee et al., 1996). The scores on the FIT-60 were higher than the average of the general population (Batink et al., 2012). The Cohen's *d* effect size for the difference between the average score of this sample on psychological flexibility and the average score of the general population on psychological flexibility is large ($d = 1.16$). The average score on the BSCS was relatively close to the average score of the general population (Tangney et al., 2004).

Table 2

Mean Scores (M), Standard Deviations (SD) and Observed Ranges of Somatic Symptoms, Physical Health, Mental Health, Psychological Flexibility, the Six Components of Psychological Flexibility and Trait Self-Control

Variable	*M*	*SD*	Observed range
Somatic symptoms (PHQ-15)	7.32	4.92	0-23
Physical health (SF-36)	47.45	9.85	17-61
Mental health (SF-36)	46.17	10.67	16-65
Psychological flexibility (FIT-60)	234.33	44.26	117-322.50
Acceptance	37.42	10.58	3-58.50
Cognitive defusion	33.58	12.29	0-60
Observing the self	33.18	7.81	6-52.50
Present moment	39.40	9.64	9-60
Values	47.37	6.67	21-60
Committed action	43.37	7.93	19.50-60
Trait self-control (BSCS)	3.19	0.62	1.69-4.77

Note. PHQ-15 is the Patient Health Questionnaire-15, SF-36 is the RAND Short Form 36, FIT-60 is the Flexibility Index Test-60 and BSCS is the Brief Self-Control Scale.

The results of the correlation analyses are shown in table 3. The correlations of psychological flexibility, its components and trait self-control with somatic symptoms were generally medium, with physical health generally small and with mental health mostly high. For all three variables, psychological flexibility generally had the highest correlations and trait self-control the lowest.

Table 3

Pearson Correlations of Psychological Flexibility, the Six Components of Psychological Flexibility and Trait Self-Control with Somatic symptoms, Physical Health and Mental Health

Variable	Somatic symptoms	Physical health	Mental health
Psychological flexibility	-.50***	.30***	.75***
Acceptance	-.46***	.27***	.70***
Cognitive defusion	-.46***	.17**	.68***
Observing the self	-.39***	.21***	.59***
Present moment	-.38***	.17**	.59***
Values	-.37***	.40***	.57***
Committed action	-.30***	.29***	.41***
Trait self-control	-.27***	.19***	.31***

Note. *$p < .05$, **$p < .01$, ***$p \leq .001$ (2-tailed).

The results of the hierarchical regression analyses are shown in table 4. In the first block of the hierarchical regression a higher age ($t = -2.74$, $p = .01$), higher education ($t = -2.72$, $p = .01$) and male gender ($t = 2.91$, $p = .004$) were associated with a lower level of somatic symptoms. A higher age ($t = -2.10$, $p = .037$), lower education ($t = 3.36$, $p = .001$) and female gender ($t = -2.48$, $p = .014$) were associated with a lower level of physical health. Mental health was associated with higher age ($t = 3.83$, $p < .001$).

In the second block higher psychological flexibility was additively associated with a lower level of somatic symptoms ($t = -8.13$, $p < .001$), a higher level of physical health ($t = 4.87$, $p < .001$) and a higher level of mental health ($t = 17.48$, $p < .001$). Higher trait self-control was associated additively with higher physical health ($t = 2.40$, $p = .02$). In block three the interaction of psychological flexibility and trait self-control had no significant association with somatic symptoms ($t = .79$, $p = .43$), physical health ($t = -.71$, $p = .48$) and mental health ($t = .94$, $p = .35$).

From the significant associations, the associations of psychological flexibility with somatic symptoms ($\beta = -0.44$), physical health ($\beta = 0.28$) and mental health ($\beta = 0.75$) were the largest. For psychological flexibility the association with mental health was the largest. Furthermore, the association of psychological flexibility with physical health was about twice as large as the association between trait self-control and physical health. Figure 1 displays the levels on somatic symptoms, physical health and mental health as observed with low (-1 *SD*) and high (+1 *SD*) of trait self-control and psychological flexibility.

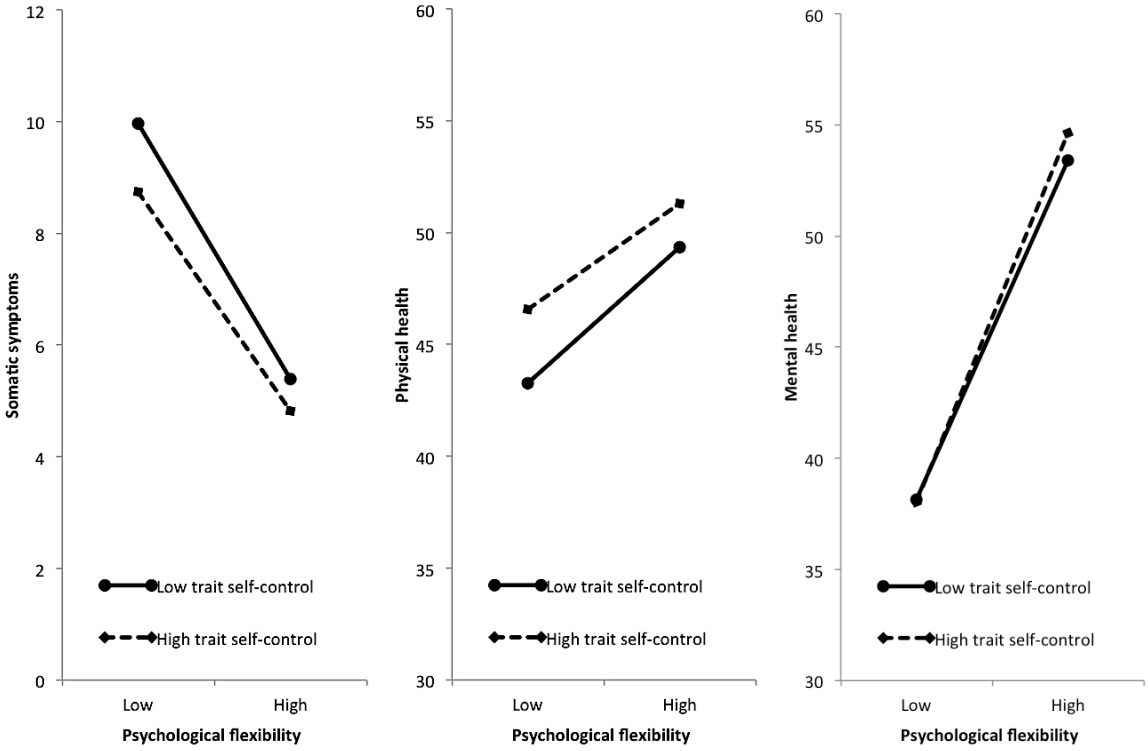

Figure 1. Somatic Symptoms, Physical Health and Mental Health Predicted by Low and High Levels of Trait Self-Control and Psychological Flexibility.

Table 4

Hierarchical Regression Analyses Predicting Somatic Symptoms (PHQ-15), Physical Health (SF-36) and Mental Health (SF-36) from Demographic Variables, Trait Self-Control and Psychological Flexibility

Variable	Somatic symptoms			Physical health			Mental health		
	b	β	Adj. R^2	*b*	β	Adj. R^2	*b*	β	Adj. R^2
Block 1			0.07			0.07			0.06
Age	-0.05**	-0.16		-0.72*	-0.12		0.14***	0.22	
Education	-1.90**	-0.15		4.75**	0.19		2.30	0.09	
Gender	1.75**	0.16		-3.00*	-0.14		-2.55	-0.11	
Block 2			0.27***			0.18***			0.56***
Age	0.002	0.005		-0.15***	-0.25		-0.01	-0.02	
Education	-0.58	-0.05		2.86*	0.12		-1.95	-0.07	
Gender	1.84***	0.17		-3.28**	-0.15		-2.45**	-0.10	
Trait self-control	-0.76	-0.10		2.19*	0.14		0.40	0.02	
Psychological flexibility	-0.05***	-0.44		0.06***	0.28		0.18***	0.74	
Block 3			0.27			0.18			0.56
Age	0.001	0.005		-0.15***	-0.25		-0.01	-0.02	
Education	-0.60	-0.05		2.88*	0.12		-1.98	-0.07	
Gender	1.84***	0.17		-3.28**	-0.15		-2.45**	-0.10	
Trait self-control	-0.73	-0.09		2.13*	0.13		0.46	0.03	
Psychological flexibility	-0.05***	-0.44		0.06***	0.28		0.18***	0.75	
Self-control x psychological flexibility	0.006	0.04		-0.01	-0.04		0.01	0.04	

Note. *$p < .05$, **$p < .01$, ***$p \leq .001$ for significance of variables and significance of the model.

The results of the exploratory hierarchical regression analyses are shown in table 5. This table shows the standardised beta (β) values from block three of the hierarchical regression analyses with age, education, gender, trait self-control, the six components of psychological flexibility and the interaction of trait self-control and psychological flexibility. The associations of the six components of psychological flexibility with somatic symptoms, physical health and mental health that were previously found with Pearson correlations, still remained after controlling for demographic variables, trait self-control, the interaction of psychological flexibility and trait self-control. However, the associations of these components with somatic symptoms and mental health were less strong than the associations of overall psychological flexibility with somatic symptoms and mental health. Physical health had a stronger association with the component values than with overall psychological flexibility.

The results of the bonferroni post hoc tests with Cohen's *d* effect sizes are shown in table 6. For the components acceptance, cognitive defusion and present moment, the significant associations with somatic symptoms reflected significant differences between the low scoring groups relative to the average and high scoring groups. The same applied to the associations of the components acceptance and committed actions with physical health and the associations of acceptance, cognitive defusion, observing the self and committed action with mental health. Other components had significant differences between all groups, some had significant differences between the low and average scoring groups and there were components that had no significantly differing groups. Generally, the significant results on somatic symptoms had small Cohen's *d* effect sizes. The significant results on physical health had medium Cohen's *d* effect sizes and on mental health large Cohen's *d* effect sizes. For most components, the Cohen's *d* effect sizes were largest when the low scoring groups were compared to the high scoring groups.

Table 5

Standardised beta values (β) *from Hierarchical Regression Analyses Predicting Somatic Symptoms (PHQ-15), Physical Health (SF-36) and Mental Health (SF-36) from Demographic Variables, Trait Self-Control and the Six Components of Psychological Flexibility*

Variable	Somatic symptoms	Physical health	Mental health
Acceptance	-0.37***	0.23***	0.65***
Cognitive defusion	-0.38***	0.15*	0.65***
Observing the self	-0.31***	0.19***	0.53***
Present moment	-0.31***	0.15*	0.55***
Values	-0.32***	0.36***	0.55***
Committed action	-0.23***	0.22***	0.37***

Note. $*p < .05$, $**p \leq .01$, $***p \leq .001$

Table 6

Bonferroni Test with Mean Differences (MD) Between Low, Middle and High Scoring Groups, with Cohen's d Effect Sizes (d) for the Differences Between Groups on the Six Components of Psychological Flexibility

Variable	Somatic symptoms		Physical health		Mental health	
	MD	*d*	*MD*	*d*	*MD*	*d*
Acceptance						
Low - Middle	2.74**	0.26	5.48**	0.52	9.38***	0.89
Low - High	3.17**	0.30	5.20*	0.49	13.72***	1.30
Middle - High	0.43		0.27		4.34	
Cognitive defusion						
Low - Middle	3.11**	0.25	3.72		10.30***	0.84
Low - High	2.39*	0.19	2.61		13.74***	1.12
Middle - High	0.71		1.11		3.45	
Observing the self						
Low - Middle	2.63*	0.34	5.20*	0.67	9.67***	1.24
Low - High	1.16		3.10		9.69***	1.24
Middle - High	1.47		2.11		0.01	
Present moment						
Low - Middle	2.61**	0.27	4.05		7.25***	0.75
Low - High	2.68*	0.28	4.78		12.57***	1.30
Middle - High	0.07		0.73		5.32*	0.55
Values						
Low - Middle	0.77		3.33		5.56*	0.83
Low - High	2.43		8.64***	1.30	12.80***	1.92
Middle - High	1.66		5.32		7.24**	1.08
Committed action						
Low - Middle	0.79		5.56**	0.70	7.80***	0.98
Low - High	2.95		7.09*	0.89	8.85**	1.12
Middle - High	2.16		1.54		1.05	

Note. $*p < .05$, $**p \leq .01$, $***p \leq .001$

Discussion

Previous research indicated a role for trait self-control and psychological flexibility in health. This current study examined the associations of trait self-control and psychological flexibility with the three health status outcomes: Somatic symptoms, physical health and mental health. The results show that people with higher psychological flexibility report fewer somatic symptoms and have better physical and mental health than people with lower psychological flexibility. The findings confirm that people with higher scores on the six components of psychological flexibility report fewer somatic symptoms and better physical and mental health than people with lower scores on the six components. The components that are most strongly associated with somatic symptoms and mental health are acceptance and cognitive defusion. Physical health is most strongly associated with values. Furthermore, psychological flexibility and its components are associated most with mental health, when compared to the other health status outcomes. The results show that people with higher trait self-control report a better physical health than people with lower trait self-control. People with higher trait self-control did not report fewer symptoms or better mental health than people with lower trait self-control. The interaction of both psychological flexibility and trait self-control does not seem to be associated with somatic symptoms, physical health and mental health. Explanations and indications of the results will be elaborated on.

The current study convincingly shows that psychological flexibility is associated with the three health status outcomes. The associations may reflect that people with higher psychological flexibility experience less somatic symptoms and better physical and mental health. It might also reflect that having less somatic symptoms and better physical and mental health promotes psychological flexibility or that a third variable explains the observed associations. ACT is an upcoming treatment for people with somatic symptoms or poor health that focuses on enhancing psychological flexibility (Hayes et al., 2006). A meta-analytic review from Powers, et al. (2009) shows that ACT establishes small to medium effects in improving physical and mental health. Furthermore, ACT is more effective in improving health than standard treatments including medication, psycho-education, psychotherapy and case management (A-Tjak et al., 2015). Based on these results and the outcomes of this study, it is likely that psychological flexibility acts as a buffer against somatic symptoms and poor health. The current study examined the associations of the six components of psychological flexibility with the three health status outcomes. When the components are higher, people report fewer somatic symptoms and better physical and mental health. Psychological flexibility and its components seem most relevant to mental health. Moreover, higher

psychological flexibility is, to a lesser extent, related to somatic symptoms and physical health. The results of the current study suggest that it is worth trying to enhance psychological flexibility and its six components in a management program for people with somatic symptoms or poor physical and mental health. Studies on the effectiveness of enhancing psychological flexibility with ACT to improve health are promising (Powers et al., 2009; A-Tjak et al., 2015).

After taking into account the role of psychological flexibility, the current study shows that higher trait self-control was associated with physical health. These results can implicate that trait self-control enhances physical health, that a better physical health enhances trait self-control or that a third variable explains the observed associations. Seligman (1975) states that people exposed to uncontrollable stress tend to fail at self-control. This may implicate that poor physical health may cause to decrease self-control. However, a study from Muraven, Tice, and Baumeister (1998) shows that lower self-control caused a reduction in the ability to work through pain and fatigue. This may implicate that higher self-control could be valuable for people with health problems, by being able to suppress the impulses of giving in to symptoms, like pain. Reflecting on the results, the ability of people with higher trait self-control to participate less in risky behaviour may be beneficial for physical health, as they are less prone to sustaining injuries. Furthermore, people with higher trait self-control might be more capable of sticking to a plan for improving their physical health. Muraven, Baumeister, and Tice (1999) tried to enhance self-control by a two-week training that consisted of improving posture, regulating moods and maintaining a diary of eating. After this training people had improved self-control and had increased physical stamina. A meta-analysis on this form of self-control training showed small effects for improving self-control (Friese et al., 2017). Future research should examine whether improving self-control, for example by self-control training, is beneficial for improving physical health. This way a possible causal relation can be determined, which the current study cannot, because of its correlational nature.

In the current study, higher trait self-control was associated with physical health, but not with somatic symptoms and mental health. The reason for not finding the hypothesised effects might reflect reality, but it might also reflect that some symptoms are uncontrollable, which creates the belief that symptoms cannot be controlled. Aldrich, et al. (2000) states that worry and fear are normal reactions to somatic symptoms, but that worries are often followed by the feeling of uncontrollability. The ability to control impulses and choose for long-term goals might not take away the feeling of uncontrollability of symptoms and health. Because of this, the association between higher trait self-control might not have been found.

Not finding the hypothesised results might also be due to ambiguity of the definition of self-control. Self-control is described in two main theories: The strength model of self-control and the discounting model of impulsiveness (Imhoff, Schmidt, & Gerstenberg, 2014). In the first theory self-control is seen as a limited resource and when the ability to control oneself is exhausted this is called ego depletion (Baumeister et al., 2007). Ego depletion is a temporary reduction in the capacity to control the self (Baumeister, Bratslavsky, Muraven, & Tice, 1998). In the second theory self-control is seen as a more stable trait, which helps to inhibit impulses and to choose for long-term outcomes (De Ridder et al., 2012). Higher trait self-control is related to less procrastination, less impulsive eating and less risky behaviours (Imhoff et al., 2014). In the current study self-control was measured with the BSCS, which measures the stable trait of self-control. The use of the BSCS was preferred, because it has been proven to give an adequate reflection of self-control in relation to health outcomes (Tangney et al., 2004). However, the questionnaire had questions about whether someone procrastinates or whether someone says inappropriate things. This way a general type of self-control was measured. The problem with measuring a general form of self-control is that people with somatic symptoms have to deal with a specific symptom-associated disability (Eccleston, 2001). There is a possibility that some people with somatic symptoms have a general ability to resist short-term pleasures for long-term goals, but at the same time they may not be able to control the specific impulse of the symptom that makes someone stay inside the house. Due to not finding the hypothesised associations, one can argue that a form of state self-control should have been measured, that is specific for the situation of dealing with somatic symptoms and poor mental health. The study of Jacob, Kerns, Rosenberg, and Haythornthwaite (1993) described a form of perceived self-control entailing the belief that someone has ability to control their somatic symptoms. This specific form of self-control is directly related to the experience of symptoms and might provide different results on the associations between self-control, somatic symptoms and mental health. Research has shown that perceived control over pain seems to be associated with health outcomes (Vallerand, Crawley, Pieper, & Templin, 2016). Future research should be done to examine whether a form of state self-control, like perceived control over pain, is associated with somatic symptoms and mental health.

This study examines the associations of the interaction of trait self-control and psychological flexibility with the three health status outcomes. Theoretically, the interaction of both higher psychological flexibility and higher trait self-control would be related to even fewer somatic symptoms and extra good health. However, the findings show that this

interaction was not associated with somatic symptoms and physical and mental health. Not finding the hypothesised results necessitates rejecting the hypothesis. Reflecting on the results, it is possible that there is a general limit to the buffering against somatic symptoms and poor health. This means that there might be a limit to the extent that psychological skills can help to reduce its impact. Psychological flexibility itself has promising results as a psychological skill to reduce the impact of somatic symptoms. Because of this, the limit may already have been reached with just having the psychological flexibility skill. When this is the case, it might not matter whether someone tries to add trait self-control or another psychological skill to one's skill repertoire, because the limit of the buffering effect has already been reached. To know whether this is the case, it would be necessary to test several interactions of psychological flexibility with other psychological skills. A possible combination would psychological flexibility with a form of state self-control. When this interaction would be associated with the three health status outcomes, the non-significant results in this study probably have to do with the specific combination of psychological flexibility and trait self-control. When this combination is not associated with the three health status outcomes as well, the possibility for a limit on the buffering effect grows. Future research is urged to examine the possible additive effects of psychological skills in the experience of somatic symptoms and poor health.

This study has methodological limitations, which were not overcome at the time of the study. A first limitation is that the sample consisted of mainly women, students, people with higher education and people with few somatic symptoms. Although recruitment was directed at other groups than students, the recruitment through the internet and through the network of the Master's students may have caused an underrepresentation of older people, people with lower education and people with somatic symptoms. In future research a better representative sample of the population should be used, by letting single students recruit participants for their own study. This way the student has to take its own responsibility to recruit a representative sample. A second limitation is that nothing is known about the medication that is being used by the participants. When people use medicine, they may have less somatic symptoms and better health. The fact that this has not been taken into account might have resulted in underreporting of somatic symptoms. In that case somatic symptoms may not have been associated with the psychological skills, but with the use of medicine. However, some indication of potential medication use is given by the report of diseases. Adding an extra question about medicine use would give the possibility to control for this. A third limitation is the scale of the FIT-60 that has been used. In this study a five point Likert scale was used,

while the validated FIT-60 has a seven point Likert scale. This may have caused people to choose for a more extreme answer category than they would have chosen with a seven point Likert scale. It is necessary to check whether the associations found in the current study are still the same and still as large when a seven point Likert scale would be used. A last limitation of the current study is the cross-sectional nature of the study, which cannot infer causality. Future research with a clinical design is needed to clarify the causal relationships of the associations that were found.

The current study has some practical implications. The findings implicate that it is useful to get clarity about the causality of the associations that were found. This can be done, by examining the effectiveness of management programs aimed at increasing psychological flexibility and self-control. For self-control the management program can consist of self-control training that trains people to override impulses (Friese et al., 2017). For psychological flexibility, ACT already shows promising results in enhancing psychological flexibility, which leads to improved health (Powers et al., 2009; A-Tjak et al., 2015). A combination of these two should be considered for improving physical health. However, future research should also focus on the chance that somatic symptoms and health may cause a change in psychological flexibility and self-control or that other variables explain the associations. Overall, the correlational data in combination with clinical studies suggest that interventions aimed at psychological flexibility may be most effective. Health care professionals should be aware of the association between psychological flexibility and its positive results on the three health status outcomes. This will help people with somatic symptoms and poor health to receive the most effective management program, which will increase well-being.

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Appendix

Table 7

Keywords and Other Ways of Finding Articles That Were Used to do the Literature Research, with Search Engine, Number of Hits and the Article References.

Way of finding the article	Search engine	Number of hits	Article
Keywords: TI=(Self-control) AND TS=(Symptom) AND TS=(Health)	World of Science	32	Park, Y. R., Park, E. Y., & Kim, J. H. (2017). Predicting health-related quality of life in cancer patients receiving chemotherapy: a structural equation approach using the self-control model. *BMC Health Services Research*, *17*, 710-716. doi: 10.1186/s12913-017-2675-4
Keywords: TS=(AAQ) AND TS=(Symptom OR Chronic OR Physical health OR Mental health)	World of Science	81	McCracken, L. M., & Zhao‐O'Brien, J. (2010). General psychological acceptance and chronic pain: There is more to accept than the pain itself. *European Journal of Pain*, *14*, 170-175. doi: 10.1016/j.ejpain.2009.03.004
"	"	"	Reneman, M. F., Kleen, M., Trompetter, H. R., Preuper, H. R. S., Köke, A., van Baalen, B., & Schreurs, K. M. (2014). Measuring avoidance of pain: validation of the Acceptance and Action Questionnaire II-pain version. *International Journal of Rehabilitation Research*, *37*, 125-129. doi: 10.1097/MR.0000000000000044
Keywords: TI=(Psychological flexibility OR Psychological inflexibility) AND TS=(Symptom OR Chronic OR Physical health OR Mental health)	World of Science	116	Densham, S., Williams, D., Johnson, A., & Turner-Cobb, J. M. (2016). Enhanced psychological flexibility and improved quality of life in chronic fatigue syndrome/myalgic encephalomyelitis. *Journal of Psychosomatic Research*, *88*, 42-47. doi: 10.1016/j.jpsychores.2016.07.009

“	“	“	McCracken, L. M., & Morley, S. (2014). The psychological flexibility model: a basis for integration and progress in psychological approaches to chronic pain management. *The Journal of Pain*, *15*, 221-234. doi: 10.1016/j.jpain.2013.10.014
“	“	“	Scott, W., Daly, A., Yu, L., & McCracken, L. M. (2017). Treatment of chronic pain for adults 65 and over: Analyses of outcomes and changes in psychological flexibility following interdisciplinary acceptance and commitment therapy (ACT). *Pain Medicine*, *18*, 252-264. doi: 10.1093/pm/pnw073
Keywords: TS=(Acceptance and commitment therapy) AND TS=(Meta-analysis)	World of Science	53	Powers, M. B., Vörding, M. B. Z. V. S., & Emmelkamp, P. M. (2009). Acceptance and commitment therapy: A meta-analytic review. *Psychotherapy and Psychosomatics*, *78*, 73-80. doi: 10.1159/000190790
“	“	“	A-tjak, J. G., Davis, M. L., Morina, N., Powers, M. B., Smits, J. A., & Emmelkamp, P. M. (2015). A meta-analysis of the efficacy of acceptance and commitment therapy for clinically relevant mental and physical health problems. *Psychotherapy and Psychosomatics*, *84*, 30-36. doi: 10.1159/000365764
Keywords: TS=(Ego depletion) AND TS=(Trait self-control)	World of Science	75	Imhoff, R., Schmidt, A. F., & Gerstenberg, F. (2014). Exploring the Interplay of Trait Self-Control and Ego Depletion: Empirical Evidence for Ironic Effects. *European Journal of Personality*, *28*, 413-424. doi: 10.1002/per.1899

General search for other forms of self-control in relation to somatic symptoms.	Google Scholar and Web of Science	-	Aldrich, S., Eccleston, C., & Crombez, G. (2000). Worrying about chronic pain: vigilance to threat and misdirected problem solving. *Behaviour Research and Therapy*, *38*, 457-470. doi: 10.1016/S0005-7967(99)00062-5
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"	"	"	Vallerand, A. H., Crawley, J., Pieper, B., & Templin, T. N. (2016). The perceived control over pain construct and functional status. *Pain Medicine*, *17*, 692-703. doi:10.1111/pme.12924
Through the references of used articles	-	-	Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes and outcomes. *Behaviour Research and Therapy*, *44*, 1-25. doi: 10.1016/j.brat.2005.06.006
"	"	"	Eccleston, C. (2001). Role of psychology in pain management. *British Journal of Anaesthesia*, *87*, 144-152. doi: 10.1093/bja/87.1.114
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“	“	“	Seligman, M. P. (1975). *Helplessness: On depression, development, and death.* San Francisco: Freeman.
Articles discussed in courses from the Bachelor’s program in Psychology and from the Master’s program Social, Health and Organisational Psychology	-	-	Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science*, *16*, 351-355. doi: 10.1111/j.1467-8721.2007.00534.x
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“	“	“	Friese, M., Frankenbach, J., Job, V., & Loschelder, D. D. (2017). Does self-control training improve self-control? A meta-analysis. *Perspectives on Psychological Science*, *12*, 1077-1099. doi: 10.1177/1745691617697076

"	"	"	Friese, M., & Hofmann, W. (2009). Control me or I will control you: Impulses, trait self-control, and the guidance of behavior. *Journal of Research in Personality*, *43*, 795-805. doi: 10.1016/j.jrp.2009.07.004
"	"	"	De Ridder, D. T., Lensvelt-Mulders, G., Finkenauer, C., Stok, F. M., & Baumeister, R. F. (2012). Taking stock of self-control: A meta-analysis of how trait self-control relates to a wide range of behaviors. *Personality and Social Psychology Review*, *16*, 76-99. doi: 10.1177/1088868311418749
"	"	"	Cameron, N., Kool, M., Estévez-López, F., López-Chicheri, I., & Geenen, R. (2018). The potential buffering role of self-efficacy and pain acceptance against invalidation in rheumatic diseases. *Rheumatology international*, *38*, 283-291. doi: 10.1007/s00296-017-3859-2
Articles about questionnaires used in this study	-	-	Batink, T., Jansen, G., & De Mey, H. (2012). De Flexibiliteits Index Test (FIT-60): Een beknopte beschrijving. *GZ-Psychologie*, *4*, 18-21. doi: 10.1007/s41480-012-0043-x
"	"	"	Kroenke, K., Spitzer, R. L., & Williams, J. B. (2002). The PHQ-15: validity of a new measure for evaluating the severity of somatic symptoms. *Psychosomatic Medicine*, *64*, 258-266. doi: 10.1097/00006842-2002030000-00008

	“	“	“	Price, C. J., & Thompson, E. A. (2007). Measuring dimensions of body connection: body awareness and bodily dissociation. *The Journal of Alternative and Complementary Medicine*, *13*, 945-953. doi: 10.1089/acm.2007.0537
	“	“	“	Soto, C. J., & John, O. P. (2017). The next Big Five Inventory (BFI-2): Developing and assessing a hierarchical model with 15 facets to enhance bandwidth, fidelity, and predictive power. *Journal of Personality and Social Psychology*, *113*, 117-143. doi: 10.1037/pspp0000096
	“	“	“	Tangney, J. P., Boone, A. L., & Baumeister, R. F. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality, 72,* 271-324. doi: 10.1111/j.0022-3506.2004.00263.x
	“	“	“	Vander Zee, K. I., Sanderman, R., Heyink, J. W., & de Haes, H. (1996). Psychometric qualities of the RAND 36-Item Health Survey 1.0: a multidimensional measure of general health status. *International Journal of Behavioral Medicine*, *3*, 104-122.
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