Examining the Effect of Conscientiousness on the Relationship between the Disruption of Differing Core Beliefs and Stress-Related Growth

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Abstract

The present study aimed to investigate the moderating effect of conscientiousness on the relationship between different core beliefs' disruption and outcomes of stress-related growth (SRG). In previous studies, it has been shown there is a positive relationship between core beliefs and their disruption with SRG. Employing the meaning-making model and cognitive processing of trauma reactions theory this relationship is further examined with conscientiousness as a moderating variable. The reason is that conscientiousness is positively correlated to SRG, in terms of underlying mechanisms and skills needed to engage in SRG. It has not been examined whether conscientiousness plays a possible factor in the relationship between core belief disruption and SRG in existing literature, nor has a distinction been made between the differing types of core beliefs and their disruption, and the different relationships they may have with SRG. By the means of a 7-day quantitative diary study among young adults, this study aims to fill this gap of knowledge. The findings of the current study suggest no moderating effect of conscientiousness on the relationships between different kinds of core beliefs and stress-related growth, though significant correlations were found for general core belief disruption and SRG, and spiritual and religious core belief disruption and SRG, indicating a possible relationship. Further research should investigate the core belief disruption distinctions and their relationship with SRG with the help of conscientiousness based on coping theories and approaches as this may be more considerate of other variables.

Keywords: Stress-Related Growth (SRG), conscientiousness, core beliefs, core belief disruption

Table of contents

Introduction

Stress is the general experience of anxiety or mental strain imposed by facing varying levels of challenges (World Health Organization, 2022). It motivates individuals to deal with problems and dangers in their lives and is experienced by everyone, but not everyone copes with it and is affected by it in the same manner (World Health Organization, 2022). Recent research has therefore been focussing on the concept of stress-related growth (SRG), defined by the changes individuals make in their behaviour and mentality concerning stressful experiences with positive outcomes as a result (Bi, Proulx & Aldwin, 2016), and what factors play a role in determining the degree to which one can engage in the processes that lead to SRG. Their research does not only focus on major stressors and traumatic life events (e.g. loss of a loved one) but also daily stressors such as driving during rush hour, physical or mental overstimulation and failing a test as it has been found that SRG can occur in these instances as well (Aldwin & Igarashi, 2012). Research has found that outcomes of SRG are dependent on sociodemographic variables, coping mechanisms, personality traits, social support and characteristics of the event to name a few (Bi, Proulx & Aldwin, 2016; Park, Cohen, & Murch, 1996), although not all domains and possible relationships have been explored as of yet, especially in the domain of daily stressors. Understanding the effects and factors of daily stressors in relation to SRG is valuable for several reasons, under which the fact that daily stressors are a big part of life and are encountered more frequently than large stressors. Gaining an understanding of the degree to which daily stressors can lead to SRG, interventions or action plans can be made to enhance an individual's skills that enhance positive outcomes of SRG as a consequence.

Stress-related growth is the positive changes as the result of mental processing of or during stressful events (LoSavio et al., 2011; Kesimci, Göral, & Gençöz, 2005), often also

referred to scientific literature as construing benefits, adversarial growth or positive adaptation (Linley & Joseph, 2012). Positive changes include broadened perspectives, new coping mechanisms, an increased tendency to appreciate life, an increase in self-confidence and self-reliance, and the building of new support systems (Park, Cohen, & Murch, 1996; Lehman et al., 1993). However, these results are not experienced similarly by everyone as there are certain factors and predictors which affect the degree to which an individual may experience SRG. Depending on the research that is performed, different theoretical perspectives and models including different factors are used to explain the processes and mechanisms leading to SRG. However, in general, it has been found repeatedly that SRG and factors such as positive coping skills, positive affect, social support, and mindfulness are positively related to the concept, to name a few (Bi, Proulx & Aldwin, 2016; LoSavio et al., 2011; Roepke & Seligman, 2015).

For the purpose and context of this research, one of the possible underlying mechanisms of SRG is the meaning-making model. This model asserts that people indulge in mental processes to decrease inconsistencies in their global meanings (broad beliefs, fundamental goals, and motivations) and situational meanings (person-environment interaction) (LoSavio et al., 2011). These mental processes involve repetitive thinking to mentally rework the circumstances of distressing events (rumination), questioning the explanation and effect of the event, which in situations of minor stressors is beneficial for growth post adversity, but not consistently for major stressors (LoSavio et al., 2011; Henson et al., 2021). Moreover, this model is often successfully used to explain a relationship between core belief (disruption) and variables such as the experience of posttraumatic stress, depression, and anxiety (Milman et al., 2020; Castiglioni et al., 2023; Henson et al., 2021). Conclusively, core belief disruption as a concept in general concerning SRG has been studied, and significant relationships have been found. However,

published studies often do not make the distinction between the different kinds of core beliefs and the disruption that the measurement methods provide, nor what factors may play an interacting role in this relationship (Cann et al., 2010; LoSavio et al., 2011).

An additional model to explain the relationship between core belief disruption and SRG is the cognitive processing model of trauma reactions by Janoff-Bulman (1992), which states pre-existing schemas, or core beliefs, are shattered when individuals are faced with adversity such as trauma or stress (Kesimci, Göral, & Gençöz, 2005; Park & Fenster, 2004). These beliefs contain information about how individuals make up themselves and the world around them, which, when they are shattered, need to be rebuilt or restructured leading to a change in the worldview of the individual (Park & Fenster, 2004). In a quantitative study conducted by Park and Fenster (2004), they mentioned that Bulman's model has been proposed as a way to understand how personal growth occurs in previous studies though very few studies have examined this explanation. It is important to note Park and Fenster's study only focused on a narrow set of beliefs related to the "benevolence of the world," "meaningfulness," and "worthiness of the Self", by using the World Assumptions Scale (WAS) (van Bruggen, 2018). This limited scope does not consider other types of beliefs that individuals may hold about the world and themselves such as religiousness, which has been proven to be related to SRG (LoSavio et al., 2011). Additionally, there is a general lack of research exploring the relationships between different kinds of beliefs and their impact on stress-related growth, as the interest lies mostly within posttraumatic growth (PTG) (Choi & In, 2019; Vázquez et al., 2021) and the general use of core beliefs and their disruption as a scale as a whole. It should be noted that one exploratory PTG study shows findings that suggest a relationship between general belief disruption and PTG, dependent on personal characteristics (Henson et al., 2021), implying new

possibilities for future research. The use of distinctions in core beliefs in research has been recommended by several scholars (Vázquez et al., 2021; Cann et al., 2010), though there is no study to be found thereof in relationship to SRG. This defines the gap of research in examining the possible relationship between core belief disruption and SRG.

To be able to engage in the necessary growth-related mental processes as part of the meaning-making model, an individual has to be able to reflect on themselves and be mindful of what they are experiencing and how to manage it. One personality trait which is commonly associated with demonstrating such skills through traits of self-control, self-discipline and self-awareness is conscientiousness, one of the Big Five personality traits (Thomas, 2022; Vázquez et al., 2021). A high score in this domain reflects those who are responsible, hard-working, and goal-directed (Roberts et al., 2014) as opposed to those who score low in this domain. Those scoring low avoid planning, are impulsive and get distracted more easily than their counterparts, making them struggle to pursue self-discipline and long-term goals (Truity, 2023). Overall, individuals who have a higher level of conscientiousness plan better and prevent themselves from experiencing severe stress in professional settings (Vázquez et al., 2021), and they exhibit behaviours such as self-regulation, persistence, and impulse control (McCrae & John, 1992). Research has shown that high levels of conscientiousness are positively correlated with adaptive coping strategies instead of using avoidance strategies (Connor-Smith & Flaschsbart, 2000) and the use of problem-solving, cognitive restructuring, and emotional regulation (Bartley & Roesch, 2011) which are some key aspects enabling the processes leading to SRG. Studies examining the relationship between conscientiousness and under which beliefs of spirituality and the belief in a just world suggest existing relationships between the concepts in predicting behaviour (Nudelman & Otto, 2021) concerning PTG as well (Henson et al., 2021). Moreover, an

interaction effect of the level of conscientiousness was found on the attribution of fairness of events depending on the believed controllability of events, in an exploratory study by Liu et al. (2012), which are both core beliefs as determined in the Core Beliefs Inventory by McKay and Fanning (n.d.). These findings suggest conscientiousness may affect the affinity with certain core beliefs and the effect of their disruption, and the degree to which individuals may experience growth post adversity as a result. It has not yet been researched explicitly how conscientiousness can affect the relationship between different types of core beliefs and their disruption and stress-related growth. Seeing as differing types of core beliefs and the personality of individuals taken together seem to play a role in the degree to which one may experience growth or regression after stress (Vázquez et al., 2021), this is an interesting viewpoint to consider exploring in research.

Based on the known traits individuals with a high level of conscientiousness display, some assumptions about this study's results can be made preliminarily. The first hypothesis considers the effect of conscientiousness on core beliefs in general and the effect of their disruption on the degree to which individuals can experience SRG. Positive relationships have been found between conscientiousness and under which competence beliefs, the belief in a just world and religious beliefs (Saroglou, 2002; Trautwein et al., 2009; Nudelman & Otto, 2021). Moreover, the delay of gratification behaviour of those with high conscientiousness levels can point to a possible heightened potential for the experience of stress-related growth in general (Nudelman & Otto, 2021). Considering these findings it is expected that a positive moderating effect can be found of conscientiousness on the relationship between core belief disruption in general and SRG.

Regarding beliefs regarding fairness, it was found that there is a significant effect of conscientiousness in predicting the level of fairness expectations (Wang et al., 2019). People with higher levels of conscientiousness had higher expectations of fair treatment than those with lower levels (Wang et al., 2019). However, a positive relationship between conscientiousness and the belief in a just world was found in a meta-analysis by Nudelmann and Otto (2019), which is the idea that essentially individuals will receive what they deserve and actions determine outcomes. Considering these findings, it can be expected that the disruption of such a belief can have a larger effect on SRG outcomes leading to the hypothesis of a positive moderating effect of conscientiousness on the relationship between fairness-related core belief disruption and SRG. Therefore, it is expected that conscientiousness has a positive moderating effect on the relationship between core belief disruption of “fairness” and stress-related growth.

In the existing literature, the assumption is that those with a higher level of conscientiousness have an internal locus of control more often than their counterparts. Additionally, longitudinal research by Abe (2005) has found positive relationships between high conscientiousness levels in childhood and adolescent internal locus of control, supported by a meta-analysis by Judge et al. (2002) who found conscientiousness to be strongly correlated to the locus of control, as well as by findings by Soltani-Nejad et al. (2021) which state that conscientious people have a higher sense of accountability. Considering these findings, it is expected that conscientiousness has a positive moderating effect on the disruption of "controllability of events" and stress-related growth.

Hypothesis four regarding "relationships with others" belief disruption is built upon the findings that conscientiousness levels have repeatedly been found to have effects on relationships, by means such as victimisation behaviour, acceptance, internalising problems and

self-control (Jensen-Campbell & Malcolm, 2007). Findings by Balliet (2010) suggest that forgiveness is highly important and dependent on conscientiousness, specifically in the domain of self-control, and can be traced back to the ability to delay gratification. This skill when faced with adversity in relationships with others indicates there could be a positive moderating effect of conscientiousness on the relationship between "relationships with others" belief disruption and stress-related growth.

Lastly, a largely studied area in the domain of conscientiousness is its relation to religiosity and spirituality. Studies have found a positive relationship between religiosity and conscientiousness, displaying responsible behaviour and having greater achievements and being more inclined to perform religious practices (Khoynezhad, 2012). Moreover, conscientiousness has a positive effect on the use of mindfulness methods in coping (Giluk, 2009), increasing the potential to experience SRG. It is expected that conscientiousness does have a positive moderating effect on the relationship between the disruption of spiritual or religious beliefs and SRG, though the literature does not point to an indication of whether this could be positive or negative.

The purpose of this study is to examine the effect of conscientiousness on the relationship between different types of core belief disruption and the outcomes of SRG using self-report measures. The hypotheses provided below are also shown in Figure 1.

H1: There is a positive moderating effect of conscientiousness on the relationship between the disruption of core beliefs and stress-related growth overall.

H2: There is a positive moderating effect of conscientiousness on the relationship between the disruption of "fairness" core belief and stress-related growth.

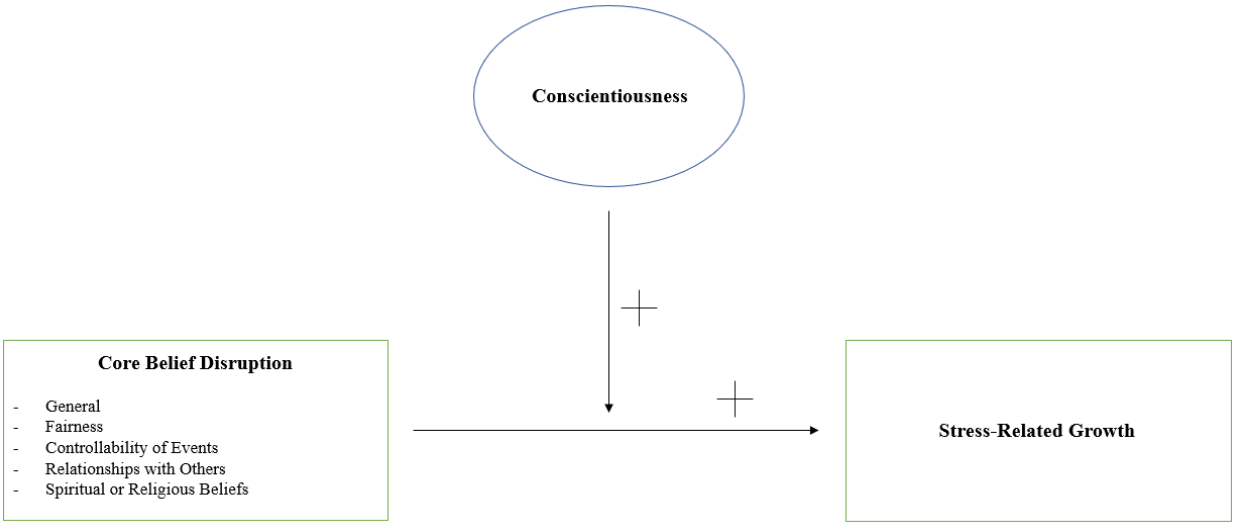
H3: There is a positive moderating effect of conscientiousness on the relationship between the disruption of the "controllability of events" core belief and stress-related growth.

H4: There is a positive moderating effect of conscientiousness on the relationship between the disruption of "relationships with others" core belief and stress-related growth.

H5: There is a positive moderating effect of conscientiousness on the relationship between the disruption of "spiritual or religious beliefs" core belief and stress-related growth.

Figure 1

Visualisations of the Hypothetical Relationships Explored in this Study



Methods

Design

A quantitative diary study was conducted to test the hypotheses. This study was performed in collaboration with three other Psychology BSc students to create the full questionnaire and gather data for each of our separate research questions. In the questionnaire, multiple variables are measured, but only the variables of the CBI measuring the disruption of beliefs regarding fairness; controllability of events; relationships; spiritual or religious beliefs

(IVs), conscientiousness (IV) and stress-related growth (DV) are used for this study specifically to test the hypotheses. Data was gathered twice a day for seven days consecutively for the variables of core belief disruption and stress-related growth. Data for the conscientiousness measure is only gathered once on the last day.

Participants

For this study, voluntary response sampling and convenience sampling were utilised to gather participants over the course of 2 weeks from the 23rd of April to the 5th of May. The participants were able to sign themselves up through the University of Twente SONA-system, a credit system from the University of Twente that obligates its students to participate in other students' studies to simplify a sufficient number of participants for every generation of students (Universiteit Twente, n.d.). Participants gathered through convenience sampling were personally contacted by the researcher to participate in the study utilizing social media (WhatsApp, Email, Instagram, Snapchat). Participants were required to possess English reading and writing skills to be able to participate in this study. Moreover, participants were required to be of at least 18 years old.

The decision to exclude participants' data was made on account of not filling in the last questionnaire regarding their conscientiousness level, as everyone was required to give consent and provide demographic information to be able to start the study. After deleting these data from the final dataset, 29 participants of the 68 remained of which 75,9% were female (n = 22) and 24,1% male (n = 7). The response and completion rate for this study lies at 100%. The age of the participants ranged from 18 to 26 years with a mean age in years of M = 22,45. Almost all participants are of European nationality, with a division of 72,4% German (n = 21) participants, 20,7% Dutch participants (n = 6), and 6,9% of individuals (n = 2) of other nationalities.

Materials and Measures

TIIM

TIIM is the abbreviation of “Twente Intervention and Interaction Machine”. It is an application platform from the University of Twente BMS-lab (The BMS Lab, 2023), designed to collect information about the selected participants through their smartphone to make it as easy and practical as possible for the participants to complete a study. Multiple studies in collaboration with the University of Twente have used this application to gather data successfully. The app displayed the whole questionnaire and notified participants about finishing the selected questionnaire, for example for this case, experience sampling every day for seven days in a row.

Daily Measurements

Stress-Related Growth Scale – Short Form (SRGS-SF). This scale was used to measure the construct of SRG. It is a 15-item questionnaire whose answers range from zero to two with zero meaning no, with 1 meaning middle or neutral and two meaning yes (De Oliveira et al., 2021). The lowest attained score was 0, and the highest was 30. The reliability is determined with the McDonald’s omega coefficient which resulted in a score of .92, indicating a high score of reliability. In this study, the cronbach’s alpha was .87, which is in accordance with the McDonald's omega coefficient. The internal structure points to it being a one-dimensional scale, and validity was determined by significant correlational scores with other variables (De Oliveira et al., 2021).

Core Beliefs Inventory (CBI). This inventory was used to measure a disruptive effect of an event on each of the 9 general core beliefs people have (Cann et al., 2010). Responses were made on a six-point Likert scale ranging from ‘‘not at all’’ (0) to ‘‘a very great degree’’ (5) in

determining if the event altered made participants re-consider their core beliefs. No data can be found about the lowest and highest scores attained in the studies conducted by Cann et al (2010). The items in this scale are separated to each measure the core belief as stated in the item, which means this scale will be used both in the form of a scale and single-item analysis method to measure of the existing nine facets of core beliefs: fairness; controllability of events; relationships; and spiritual or religious beliefs, as well as a full scale. Several studies have proven single-item studies to be as valid and reliable as multiple-item measures under the assumption that the measure will provide adequate assessment of the construct of interest (Allen et al., 2022), highlighting the reason to use the CBI in this manner. The reliability and validity score for this scale were good (Cann et al., 2010), but considering the importance laying within the item-by-item analysis method in this study this is not of major importance.

One-Time Measurement

The Big Five Inventory (BFI). This inventory was used to measure the construct of conscientiousness. This is a shortened 44-item scale to measure each of the facets of the Big Five personality traits, however, only the items responsible for measuring conscientiousness were implemented into the final questionnaire (Benet-Martinez & John, 1998; John, et al., 1991; John, et al., 2008). Responses were made on a 5-point Likert scale ranging from “Disagree strongly” (1) to “Agree Strongly” (5) in determining if the prompt suits their personality. The Cronbach's alpha for the conscientiousness measure of the BFI lies at a score of .81 which is determined as good, and a G-coefficient of .84

which translates to an acceptable reliability of the scale (Arterberry et al., 2014). The Cronbach's alpha for this measure in this study was .72 which refers to an acceptable internal consistency.

Procedure

The sampling of the participants and gathering of data could start after receiving ethical approval from the BMS committee. The data collection was scheduled for two weeks consecutively in total from the 23rd of April to the 5th of May. The information about possible participation in the study was received by the participants via the UT SONA system and the social media platform Instagram with a brief description of the study for information purposes, as well as personal messages from the researchers to acquaintances via WhatsApp. Through SONA, WhatsApp and Instagram participants received the link to download the TIIM application. Once participants request enrolment by entering the enrolment code, every participant is manually accepted in the system by one of the researchers to be able to start the intervention the following day at 8 AM.

On the first day, the students received a notification on their phone at 18.00 (“Hey! It’s time to start with the first questionnaire :-)”), as well as a reminder notification at 21.00 (“Have you already filled out the first questionnaire? :-)” to fill out the 52-item starting questionnaire (see Appendix A) consisting of the information form (see Appendix B), informed consent form (see Appendix C), demographic data questions and questions about all daily measured variables, of which only the answers on the items regarding the event, core beliefs and SRG are used in this research (items 10 to 19 and 38 to 52). The participants were given a study information sheet to read about the study's objectives before beginning the questionnaires, along with an informed consent form to accept or deny. If participants did not agree with the informed consent form, they were routed to a screen that informed them they were able to stop the study and shut off the application (see Appendix D). Each participant was asked about their demographics and after that, they were able to start with the daily questionnaire measuring the dependent and independent variables.

In the following six days, the participants received two questionnaires per day, the sleep questionnaire in the morning (with the notification “Good morning” :-) Did you sleep well? Tell us about it!” at 7.00 and the reminder notification “Hey, don’t forget to tell us about how you slept last night :-)” at 11.00) as well as the daily questionnaire in the evening (with the notification “Hey :-) Did you experience stress today? Let us know!” at 18.00 and “Did you already fill out our daily survey? :-)” at 21.00). The 36-item daily questionnaire (see Appendix E) took approximately 10 to 15 minutes per day. For this study, only the answers on the items regarding the event, core beliefs and SRG are used in this research (items 1 to 10 and 22 to 36) are used, which are only part of the questionnaire in the evening.

On the last day, the participants filled out the two daily questionnaires as before and additionally, they were asked to fill out the one-time questionnaire, which took approximately 10 minutes. This survey consisted of 25 items regarding the personality of the participants, considering conscientiousness and neuroticism (see Appendix F), for which only the answers given to items 17 to 25 are taken into account for the data analysis as these measure conscientiousness. For this survey participants received a notification at 19.00 stating “It is almost over! Just fill out one last survey! :-)”, as well as at 21.00 the reminder notification “Have you already filled out the last survey? :-)”. After that, the data collection of the week is over for the participant.

Data analysis

Data preparation and analysis are performed in RStudio (version 3.4.0). First, day 6 was excluded from the dataset, since issues with the TIIM app made it impossible for participants to fill out this daily questionnaire. Afterwards, participants who did not complete the final questionnaire were deleted, resulting in a sample of 29 participants to perform data analysis. The

dataset was formatted correctly and mistakes were altered. Lastly, data were checked for any missing values, and participants were eliminated based on the exclusion criteria.

After the preparation of the dataset, mean scores for each of the participants per variable were calculated. Then, the assumptions were tested to check if a parametric test would be appropriate to conduct with this dataset. First, bar plots were used to test normality, and scatter plots were used to test linearity for each of the variables separately. A linear mixed model (LMM) combined with a histogram of the residuals per model was fitted to the data to test for equal variances. Next, a correlation matrix was made with Spearman's correlation method, to see if there are any possible relationships between the variables and what it would look like using the Spearman method. Cronbach's Alpha was calculated for each of the variables to check the internal consistency reliability of the measures. Once data was checked for validity for further analysis, descriptive statistics were determined to provide an overview of the characteristics of the study sample. Lastly, the means and standard deviations were calculated.

Linear mixed models (LMMs) were run to test the relationships between SRG as the response, conscientiousness (CSS) as one predictor and the disruption of each of the core beliefs, fairness; controllability of events; relationships; and spiritual or religious beliefs as another predictor, with participants' ID as a random effect and including a moderating effect of conscientiousness and the corresponding CB variable of the code.

Results

The assumptions of normality linearity for the possible relationships were violated for each core belief. All models did abide by the assumption of equal variance. An overview of the experienced stressors is shown in Table 1.

Table 1

A Frequency Table of the Experienced Stressors per Day

Stressor / Day	Academic Pressure	Financial Concern	Job-Related	Health Concern	Social Stressor	Other
1	15	2	1	1	7	3
2	11	2	2	5	6	3
3	6	2	1	3	10	7
4	6	1	0	4	17	1
5	9	2	1	2	17	3
7	11	1	2	4	7	4
Total	58	10	7	19	64	21

Social and academic stressors occurred most often as the most stressful event during the day. Several participants reported other stressors which are counted under “other”, of which examples are travelling issues, lack of sleep and having a long to-do list (non-academic). Correlations and their significance values between each of the items are shown in Table 2.

Table 2

Correlation Matrix of all the Variables

Variable	Conscientiousness	SRG	Core Beliefs in General	Fairness	Controllability of Events	Relationships	Spiritual Beliefs
Conscientiousness	1.00	.02	-.001	.19	.20	.32	-.14
SRG	-	1.00	.41*	.35	.32	.20	.39*
Core Beliefs in General	-	-	1.00	.57**	.84**	.64**	.55**
Fairness	-	-	-	1.00	.72**	.55**	.21

Controllability of Events	-	-	-	-	1.00	.65**	.32
Relationships	-	-	-	-	-	1.00	.30
Spiritual Beliefs	-	-	-	-	-	-	1.00

** indicates p < .05*
*** indicates p < .01*

Most strong significant correlations were found between core beliefs as a general measure with each of the separated items “fairness”, “controllability of events”, “relationships” and “spiritual beliefs”, and between the specific core belief items “fairness”, “controllability of events”, “relationships” and “spiritual beliefs” as well. Another moderate and significant correlation was found between stress-related growth and core beliefs in general. No significant correlations were found between conscientiousness and all other variables. The means and standard deviations of the scores for each variable per day are shown in Table 3.

Table 3

Means and Standard Deviation Scores of the Variables Per Day for Each Variable

Day	Core Beliefs (general)	Fairness	Controllability of Events	Relationships	Spiritual Beliefs	SRG	Conscientiousness
1	3.04	2.69	2.86	2.52	1.38	.71	-
2	2.64	2.31	2.31	2.41	1.24	.62	-
3	2.57	2.14	2.38	2.83	1.31	.59	-
4	2.74	2.38	2.80	3.10	1.24	.66	-
5	2.63	2.41	2.97	2.62	1.17	.69	-
7	2.79	2.52	2.97	2.90	1.24	.71	3.45

Total mean	2.34	2.41	2.71	2.73	1.26	.66	3.45

The LMM was applied to test the relationships between the dependent variables SRG, with a moderating independent variable conscientiousness and the independent variables of the disruption of each of the core beliefs "fairness", "controllability of events", "relationships", and " spiritual beliefs". The fixed effects coefficients and their associated standard errors for the models for all CB items for which this testing was performed are presented in Table 4, as well as their t-value and p-value.

Table 4

Summary of the Linear Mixed-Effects Results for Each Model

Predictor	Coefficients	Standard Error	t-value	p-value
Model 1 (Core Beliefs General)				
Intercept	.74	.67	1.09	.28
Core Beliefs General	.08	.18	.42	.67
Conscientiousness	-.12	.19	-.61	.54
Core Beliefs General:Conscientiousness	.01	.05	.26	.80
Model 2 (Fairness)				
Intercept	1.19	.46	2.58	.03
Fairness	-.10	.09	-1.09	.28
Conscientiousness	-.17	.13	-1.28	.21
Fairness:Conscientiousness	.04	.03	1.35	.18
Model 3 (Controllability of Events)				
Intercept	.88	.49	1.80	.08

Controllability of Events	.03	.10	.32	.75
Conscientiousness	-.08	.14	-.59	.56
Controllability of Events:Conscientiousness	-.001	.03	-.05	.96
Model 4 (Relationships)				
Intercept	0.63	.48	1.33	.19
Relationships	.13	.09	1.51	.13
Conscientiousness	-.02	.14	-.17	.87
Relationships:Conscientiousness	-.03	.02	-1.06	.29
Model 5 (Spiritual Beliefs)				
Intercept	.64	.55	1.17	.25
Spiritual Beliefs	.12	.23	.54	.60
Conscientiousness	-.03	.16	-.20	.84
Spiritual Beliefs:Conscientiousness	-.01	.07	-.08	.94

Coefficients of the moderating effect were positive for the models for core belief disruption in general and fairness with SRG indicating a possible positive moderating effect of conscientiousness on the relationship. These were negative for the models of beliefs regarding controllability, relationships and spirituality with SRG, indicating a negative moderating effect of conscientiousness on the relationship. All coefficients for all models for core beliefs: fairness; controllability of events; relationships; and spiritual or religious beliefs, as well as the general core belief disruption score proved insignificant, meaning that the coefficients which were found do not have a significant moderating effect of conscientiousness on the relationship of the core belief disruption and SRG for all models tested. These results show that the hypotheses below are not confirmed.

H1: There is a positive moderating effect of conscientiousness on the relationship between the disruption of core beliefs and stress-related growth overall.

H2: There is a positive moderating effect of conscientiousness on the relationship between the disruption of "fairness" core belief and stress-related growth.

H3: There is a positive moderating effect of conscientiousness on the relationship between the disruption of the "controllability of events" core belief and stress-related growth.

H4: There is a positive moderating effect of conscientiousness on the relationship between the disruption of "relationships with others" core belief and stress-related growth.

H5: There is a positive moderating effect of conscientiousness on the relationship between the disruption of "spiritual or religious beliefs" core belief and stress-related growth.

Discussion

The present study investigated the moderating effect of conscientiousness (CSS) on the relationship between the disruption of core beliefs in general, and that of fairness, controllability of events, relationships and spiritual or religious beliefs and the concept of stress-related growth (SRG). It was hypothesised that conscientiousness would have a positive moderating effect on the relationship between the core belief disruption in general and the specific beliefs namely fairness, controllability of events, relationships, and spiritual or religious beliefs, and the concept of SRG. The results from the linear mixed-effects models (LMM) to test these hypotheses revealed the following findings.

Analyses indicated that the effect of coefficients for all models (core beliefs in total; fairness; controllability of events; relationships; and spiritual or religious beliefs), the effect of the specific core belief and the interaction effect of conscientiousness on the core belief are non-significant. The non-significance of the effect of conscientiousness on the relationship between

core belief disruption in general, and that of all of the beliefs separately, on the degree of stress-related growth experience of individuals do not confirm any of the hypotheses. Small correlations were found between the disruption of core beliefs in general; fairness; controllability of events; relationships; and spiritual or religious beliefs with the concept of SRG, though these were only significant for core beliefs in general and spiritual or religious beliefs. Although the correlations do not provide a comprehensive understanding of the underlying mechanisms and do not include the moderating effect of conscientiousness, they suggest the need for further exploration of the complex dynamics between core belief disruption and SRG. Though something can be said about the varying directions found of the coefficients per core belief disruption in the LMM, these were not significant either, indicating no moderating effect of conscientiousness on the relationship between core belief disruption in general, and for beliefs regarding fairness, controllability of events, relationships, and spiritual or religious beliefs and SRG.

The finding that conscientiousness does not have a significant effect on the relationship between core belief disruption in general and SRG can have multiple explanations. One major explanation can be the limitation of the use of the meaning-making model and cognitive processing model of trauma reactions to explain and examine the outcomes of this research. Prior research has established that conscientiousness is associated with under which adaptive coping, effective problem-solving, self-regulation, persistence, and impulse control (Connor-Smith & Flaschsbart, 2000; Thomas, 2022; Vázquez et al., 2021). Some of these traits and skills have been linked to stress-related growth, as well as the prediction of certain beliefs conscientious people may have (e.g. fairness and controllability) though the exact relationship remained covered (Saroglou, 2002; Trautwein et al., 2009; Nudelman & Otto, 2021).

Using the meaning-making model and the cognitive processing model of trauma reactions this relationship was attempted to be explained in combination with the mechanism of core belief disruption. The disruption of core beliefs is a process that needs the re-evaluation of one's existing beliefs about themselves, others and the world which can trigger the need for meaning-making (LoSavio et al., 2011). Overall, it can be said that with the complexity in mind, the non-significant effect of conscientiousness on general core belief disruption, but also that in the domains of fairness, controllability of events, relationships and spiritual or religious beliefs, might be due to others factors which are not included in the analysis nor theoretical models used. These can be emotional processing, social support, and coping strategy to name a few of the concepts that are part of either of the theories. Moreover, the existing findings which this study is partially based on are examined in the relationship with trauma (PTG), which is not the same as (daily) stressors (SRG). Significant findings concerning PTG may not translate to SRG, resulting in the non-significant findings of this research (Choi & In, 2019; Vázquez et al., 2021). Moreover, specifically daily stressors may not affect core beliefs enough to cause a disruption considering the healthy sample with which this study was performed, further elaborating on the reason for differentiation between growth concepts that were measured. Additionally, the discovered connections between several beliefs and conscientiousness are used to predict behavioural outcomes of individuals with differing conscientiousness levels, more so than determining whether changes in their expectations set to adversity related growth.

Despite the lack of significant effects in the LMM, the study identified few significant correlations between SRG and core belief disruption in general, as well as between SRG and spiritual and religious beliefs. These correlations imply that there may still be some relationship between disruptions in core beliefs, particularly in the spiritual and religious domain, and the

experience of stress-related growth in individuals. Although the correlations do not provide a comprehensive understanding of the underlying mechanisms, they suggest the need for further exploration of the complex dynamics between core belief disruption and SRG.

One significant contribution of this research lies in highlighting the limitations of using the meaning-making model and cognitive processing model of trauma reactions to explain and examine the outcomes observed in this study. While prior research has established a connection between conscientiousness and under which adaptive coping strategies, problem-solving skills, and self-regulation, the exact relationship between stress-related growth and specific beliefs remains unclear. The disruption of core beliefs involves a process of re-evaluating existing beliefs about oneself, others, and the world, which can trigger the need for meaning-making. However, the non-significant effects observed regarding conscientiousness and core belief disruption suggest the influence of other unexplored factors, such as emotional processing, social support, and coping strategies, which are integral to both theoretical models. Lastly, it is essential to consider the distinction between trauma-related growth (PTG) and stress-related growth (SRG). The existing findings related to PTG may not necessarily translate to SRG, especially daily stressors, as traumatic events have distinct impacts on individuals' belief systems and growth experiences.

In summary, conscientiousness does not moderate the effect of core belief disruption in general and specifically the types: of fairness; controllability of events; relationships; and spiritual or religious beliefs. Significant correlations suggest a potential relationship between core belief disruption in general and SRG, and spiritual and religious belief disruption and SRG, though an explanation for these correlations cannot be further substantiated with the theoretical background used in this research.

Limitations

This study contains some limitations. Several are founded in time and resources, under which the decision to not choose the best fitting scale for core belief disruption due to time constraints. This has led to the use of the CBI which by itself does not make a distinction between the differing core beliefs in its scoring system and is typically used in a clinical setting. Despite these issues, single-item analysis was performed with the shortened CBI to be able to answer the hypotheses, as it has been highlighted that the use of a scale with the single-item method can be reliable and valid. A suggestion would be to create a Core Belief Inventory that includes a range of items for the differing core beliefs as determined by the original 100-item CBI by McKay and Fanning (n.d.) but is not as lengthy for daily measurements, as no other alternatives exist that would solve the issue of comprehensiveness of the scale. This ensures a more thorough measure for each of the kind of core beliefs and their disruption while not requesting a large amount of time to participate daily. Otherwise, it is suggested to focus on testing a few core belief domains per study, utilising the 100-item CBI, where the whole of the 100-item CBI can be used for the domains without the excessive length of completing the full scale daily. The time constraint specifically has also led to a small window of gathering participants which played an important role in creating the small sample size for this study. The use of a longer one-time measurement narrowed down the sample size as some individuals may not find the time and motivation to participate, though this does increase the reliability of the answers provided. The small sample size also leads to complications of generalising the results to the general population, as there is a gender, age and educational level bias. Overall, it is recommended to provide a bigger window to gather data to ensure inclusivity and possibly

narrow down the time of gathering data itself from 7 days to fewer to be more efficient time-wise.

Another complication and limitation of this research is the means used to gather data, namely the TIIM app as created by the BMS Lab of the University of Twente. Multiple software-related problems occurred when gathering data, such as display problems leading to an inability to answer items and participants not receiving notifications that were implemented due to the settings of the phone. It has led to only a small number of participants being able to finish the study and be included in the analysis. However, the use of an online format to gather data increases the convenience for both participants and researchers in accessing the questionnaires and exporting data. The use of an online data-gathering tool is stimulated, though it is advised to look into its reliability and software issues before deciding to use it if more options are available, possibly preventing the loss of data.

Lastly, the theoretical backgrounds used to explain possible relationships may not be fitting to the variables measured to their complex nature. It seems as if the meaning-making model is a good theory to explain core belief disruption concerning SRG, but the cognitive processing of trauma reactions may not be as its nature lies within trauma rather than (daily) stressors. Both theories do not seem to take into account factors which have to do with the personality trait of conscientiousness. It is recommended to look more into conscientiousness concerning coping strategies and the effect that it has on the relationship between core belief disruption and SRG as findings regarding conscientiousness, core belief disruption and SRG can be explained by the use of this concept.

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Appendix A

First Day Questionnaire Items

What is your SONA ID?

____

How old are you in years?

____

As what do you identify?

Gender.

- Female
- Male
- Other; ___

What is your field of study?

____

What is your nationality?

___

Which type of event did you regard as the most stressful event today?

→ Tick the box that best describes your most stressful event today

- Academic pressure (upcoming deadlines/exams, high workload, poor performance)
- Social stressors (argument with someone, let down by friend, family member, partner)
- Job related stressor
- Financial concern
- Health concerns (illness, injury, accident)
- Other (briefly name the event)

Please reflect upon the event about which you are reporting and indicate the extent to which it led you to seriously examine each of the following core beliefs.

1. Because of the event, I seriously examined the degree to which I believe things that happen to people are fair. [1/2/3/4/5/6]
2. Because of the event, I seriously examined the degree to which I believe things that happen to people are controllable. [1/2/3/4/5/6]
3. Because of the event, I seriously examined my assumptions concerning why other people think and behave the way that they do. [1/2/3/4/5/6]
4. Because of the event, I seriously examined my beliefs about my relationships with other people. [1/2/3/4/5/6]
5. Because of the event, I seriously examined my beliefs about my own abilities, strengths and weaknesses. [1/2/3/4/5/6]
6. Because of the event, I seriously examined my beliefs about my expectations for my future. [1/2/3/4/5/6]
7. Because of the event, I seriously examined my beliefs about the meaning of my life. [1/2/3/4/5/6]
8. Because of the event, I seriously examined my spiritual or religious beliefs. [1/2/3/4/5/6]
9. Because of the event, I seriously examined my beliefs about my own value or worth as a person. [1/2/3/4/5/6]

Please report on your last night's sleep.

1. I could not get to sleep within 30 minutes [yes/no]
2. I woke up in the middle of the night or early morning [yes/no]
3. I had to get up to use the bathroom [yes/no]
4. I coughed or snored loudly [yes/no]
5. I felt too cold or too hot [yes/no]
6. I had bad dreams [yes/no]
7. I had pain [yes/no]

Controllability - Please respond based on how you have been coping with the particular stressor you indicated today.

How controllable did you perceive this event? [1/2/3/4/5]

Refocus on planning

I thought about how to change the situation. [1/2/3/4/5]

I thought about a plan of what I can do best in this situation. [1/2/3/4/5]

Acceptance

I thought that I have to accept that this has happened. [1/2/3/4/5]

I thought that I have to accept the situation. [1/2/3/4/5]

Positive reappraisal

I thought that I can learn something from the situation. [1/2/3/4/5]

I thought that I can become a stronger person as a result of what has happened. [1/2/3/4/5]

Please reflect on the following statements in regards to the stressful event of today.

1. I've been getting emotional support from others. [I haven't been doing this at all / a little bit / a medium amount / I've been doing this a lot]
2. I've been getting help and advice from other people. [I haven't been doing this at all / a little bit / a medium amount / I've been doing this a lot]
3. I've been getting comfort and understanding from someone. [I haven't been doing this at all / a little bit / a medium amount / I've been doing this a lot]
4. I've been trying to get advice or help from other people about what to do. [I haven't been doing this at all / a little bit / a medium amount / I've been doing this a lot]

Please examine how this statement is applicable to you.

1. I learned to be nicer to others. [0/1/2/]
2. I feel freer to make my own decisions. [0/1/2/]
3. I learned that I have something of value to teach others about life. [0/1/2/]
4. I learned to be myself and not try to be what others want me to be. [0/1/2/]
5. I learned to work through problems and not just give up. [0/1/2/]
6. I learned to find more meaning in life. [0/1/2/]

7. I learned how to reach out and help others. [0/1/2/]
8. I learned to be a more confident person. [0/1/2/]
9. I learned to listen more carefully when others talk to me. [0/1/2/]
10. I learned to be open to new information and ideas. [0/1/2/]
11. I learned to communicate more honestly with others. [0/1/2/]
12. I learned that I wanted to have some impact on the world. [0/1/2/]
13. I learned that it's OK to ask others for help. [0/1/2/]
14. I learned to stand up for my personal rights. [0/1/2/]
15. I learned that there are more people who care about me than I thought. [0/1/2/]

Appendix B

Information Form of the Survey

Welcome.

You have been invited to participate in a BSc Thesis study for Psychology regarding stress-related growth (SRG). This study is conducted by Hanna Ausländer, Evrim Kayikcio, Marlyn Kolenbrander, and Pia Kronenfeld under supervision of Y. Namer (PhD.) and M. Radstaak (PhD.) from the Faculty of Behavioural, Management, and Social Sciences at the University of Twente. This study has been approved for conduction by the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences at the University of Twente .

In this study, you will be filling in a daily questionnaire regarding daily stressful experiences, stress-related growth, social support, quality of sleep, core beliefs, level of conscientiousness, neuroticism, and openness, and coping mechanisms. This daily questionnaire will take around 10 minutes every day to complete. At the end you will also complete a survey for variables that only need to be measured once; the personality traits of conscientiousness, neuroticism and openness, and social support. This survey will take around 20 to 25 minutes to complete. The data that is gathered will be used and analysed solely by the researchers mentioned above.

Your participation in this study is entirely voluntary and you are allowed to withdraw at any time during the process. However, in case of withdrawal you will not receive the SONA points as stated on the information section. To the best of our ability your provided answers will remain

confidential. Therefore, the provided results and answers will be presented anonymously in the report. Personally-identifiable data will not be stored permanently.

If you provide your email below, you are interested in the research results and would like to receive these by email.

email

Student and supervisor contact details for further information:

Hanna Ausländer (h.j.auslander@student.utwente.nl)

Evrim Kayikcio (e.kayikcio@student.utwente.nl)

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Appendix C

Informed Consent Form

This questionnaire is conducted to gain insights into stress-related growth after daily events and the following variables; social support, quality of sleep, core beliefs, level of conscientiousness, neuroticism, and openness, and coping mechanisms. Please make sure you read and understand the following statements by selecting “yes”.

I am voluntarily filling out this questionnaire and understand that I may withdraw from this participation at any time, without any negative consequences and without providing reasons.
I agree that my answers will be stored and saved, for the purpose of the interview and research.
I understand that the answers will remain anonymous. I understand that the other researchers and their supervisor will be able to see the stored and saved answers.
I understand that my personal information will not be misused or shared beyond the study team.
I understand that data gathered from this study might be used for further research.
I give my consent to participate in the study which involves answering certain questions regarding my experience of stress-related growth in daily settings.
I understand that the daily questionnaire will take approximately 10 minutes.
I understand that the one-time questionnaire will take approximately 20 to 25 minutes.

[Yes / No]

Appendix D

Informed Consent Non-Given Message

You have indicated you do not agree with our consent form.

Therefore, you are omitted from the data set and are not required to participate in this study.

You can now close the application.

Thank you for your time.

Appendix E

Daily Questionnaire Items

Which type of event did you regard as the most stressful event today?

→ Tick the box that best describes your most stressful event today

- Academic pressure (upcoming deadlines/exams, high workload, poor performance)
- Social stressors (argument with someone, let down by friend, family member, partner)
- Job related stressor
- Financial concern
- Health concerns (illness, injury, accident)
- Other (briefly name the event)

Please reflect upon the event about which you are reporting and indicate the extent to which it led you to seriously examine each of the following core beliefs.

1. Because of the event, I seriously examined the degree to which I believe things that happen to people are fair. [1/2/3/4/5/6]
2. Because of the event, I seriously examined the degree to which I believe things that happen to people are controllable. [1/2/3/4/5/6]
3. Because of the event, I seriously examined my assumptions concerning why other people think and behave the way that they do. [1/2/3/4/5/6]
4. Because of the event, I seriously examined my beliefs about my relationships with other people. [1/2/3/4/5/6]
5. Because of the event, I seriously examined my beliefs about my own abilities, strengths and weaknesses. [1/2/3/4/5/6]
6. Because of the event, I seriously examined my beliefs about my expectations for my future. [1/2/3/4/5/6]
7. Because of the event, I seriously examined my beliefs about the meaning of my life. [1/2/3/4/5/6]
8. Because of the event, I seriously examined my spiritual or religious beliefs. [1/2/3/4/5/6]

9. Because of the event, I seriously examined my beliefs about my own value or worth as a person. [1/2/3/4/5/6]

Please report on your last night's sleep.

1. I could not get to sleep within 30 minutes [yes/no]
2. I woke up in the middle of the night or early morning [yes/no]
3. I had to get up to use the bathroom [yes/no]
4. I coughed or snored loudly [yes/no]
5. I felt too cold or too hot [yes/no]
6. I had bad dreams [yes/no]
7. I had pain [yes/no]

Controllability - Please respond based on how you have been coping with the particular stressor you indicated today.

How controllable did you perceive this event? [1/2/3/4/5]

Refocus on planning

I thought about how to change the situation. [1/2/3/4/5]

I thought about a plan of what I can do best in this situation. [1/2/3/4/5]

Acceptance

I thought that I have to accept that this has happened. [1/2/3/4/5]

I thought that I have to accept the situation. [1/2/3/4/5]

Positive reappraisal

I thought that I can learn something from the situation. [1/2/3/4/5]

I thought that I can become a stronger person as a result of what has happened. [1/2/3/4/5]

Please reflect on the following statements in regards to the stressful event of today.

5. I've been getting emotional support from others. [I haven’t been doing this at all / a little bit / a medium amount / I’ve been doing this a lot]

6. I've been getting help and advice from other people. [I haven't been doing this at all / a little bit / a medium amount / I've been doing this a lot]
7. I've been getting comfort and understanding from someone. [I haven't been doing this at all / a little bit / a medium amount / I've been doing this a lot]
8. I've been trying to get advice or help from other people about what to do. [I haven't been doing this at all / a little bit / a medium amount / I've been doing this a lot]

Please examine how this statement is applicable to you.

1. I learned to be nicer to others. [0/1/2/]
2. I feel freer to make my own decisions. [0/1/2/]
3. I learned that I have something of value to teach others about life. [0/1/2/]
4. I learned to be myself and not try to be what others want me to be. [0/1/2/]
5. I learned to work through problems and not just give up. [0/1/2/]
6. I learned to find more meaning in life. [0/1/2/]
7. I learned how to reach out and help others. [0/1/2/]
8. I learned to be a more confident person. [0/1/2/]
9. I learned to listen more carefully when others talk to me. [0/1/2/]
10. I learned to be open to new information and ideas. [0/1/2/]
11. I learned to communicate more honestly with others. [0/1/2/]
12. I learned that I wanted to have some impact on the world. [0/1/2/]
13. I learned that it's OK to ask others for help. [0/1/2/]
14. I learned to stand up for my personal rights. [0/1/2/]
15. I learned that there are more people who care about me than I thought. [0/1/2/]

Appendix F

Questionnaire Items of the One-Time Questionnaire on the Last Day

***Please reflect on the following statements. I would describe myself as someone who…**

1. Is talkative (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly)
2. Is depressed, blue (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly)
3. Is reserved (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly) R
4. Is relaxed, handles stress well (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly) R
5. Is full of energy (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly)
6. Can be tense (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly)
7. Generates a lot of enthusiasm (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly)
8. Worries a lot (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly)
9. Tends to be quiet (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly) R
10. Is emotionally stable, not easily upset (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly) R
11. Has an assertive personality (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly)
12. Can be moody (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly)
13. Is sometimes shy, inhibited (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly) R

14. Remains calm in tense situations (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly) R
15. Is outgoing, sociable (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly)
16. Gets nervous easily (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly)
17. Does a thorough job (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly)
18. Can be somewhat careless (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly) R
19. Is a reliable worker (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly)
20. Tends to be disorganised (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly) R
21. Tends to be lazy (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly) R
22. Perseveres until the task is finished (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly)
23. Does things efficiently (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly)
24. Makes plans and follows through with them (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly)
25. Is easily distracted (disagree strongly - disagree a little - neither agree nor disagree - agree a little - agree strongly) R

* R = scoring is reversed