Exploring the Variability and Association of Grit and Self-compassion over Time in Daily Lives of Students: An Experience Sampling Study

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Abstract

Background. Nowadays, students appear to be happy about their future and are very focused on performance. This urge to achieve goals, despite obstacles, falls under the personality trait grit. In addition to the qualities of grit, too much grit can make it difficult to set boundaries, to be self- compassionate and to experience more stress from pressure to perform. So, there seems to be a disbalance where high levels of grit appear to affect lower self-compassion, and it seems to vary at the intrapersonal level. **Objective**. To investigate whether self-compassion is predicted by grit, these constructs are repeatedly measured at multiple times. First, the relationship between average state self-compassion and trait grit is analyzed. Next, the between-person and the within-person association between state grit and state self-compassion is examined. Finally, the within-person association based on high or low trait levels of trait grit is analyzed. **Method**. This study used an Experience Sampling Method to measure the state and trait levels of grit and self-compassion. For one week, participants (N=30) reported their experience of grit and self-compassion three times a day. **Results**. This study showed that there is a weak positive association between average state self-compassion and trait grit. Furthermore, a moderate positive between-person association and a weak positive within-person association was found between state self-compassion and state grit. Finally, a weak association was found at the intrapersonal level within both the high and low trait grit group. The confidence intervals of the two groups overlap, which means that there is insufficient evidence to conclude that the two groups differ from each other. Therefore, no difference in the intrapersonal association was found between grit and self-compassion when they experienced a high or low degree of trait grit. **Conclusion**. This study showed that when students experience a higher degree of grit, they also have slightly increased self-compassion. This means that while students achieving their goals, they can still take care of themselves and reflect on their mistakes. State self-compassion is mainly predicted by the average grit the student experiences that week. The degree of stress that students experience, in particular due to pressure to perform, and the difficulty to set boundaries for individuals with high pressure to perform, cannot therefore be directly explained by these results of the study. Therefore, it is recommended that other factors, such as intrinsic and extrinsic motivation, autonomy, and relatedness, be included in future research with a bigger sample size, to investigate whether they are a better predictor of self-compassion and can explain the degree of stress from performance pressure.

Exploring the variability and association of Grit and Self-compassion over time in daily lives of students

Nowadays, many students are generation Y, also known as the millennials. According to Howe, Strauss, and Matson (2000) this generation, born between 1982 and 2004, is now developing into adulthood and is known in the literature as a more educated, cheerful, and optimistic generation. Research has found increased levels of neuroticism, narcissism, self-confidence, perseverance and self-assurance in millennials and this generation indicates higher levels of happiness about their future (Samuelsen et al., 2019; Suar, Jha, Das, Alat, and Patnaik, 2020). Some researchers suggest that this behavior is because this generation has learned to focus on effort over performance (Samuelsen et al., 2019). A personality trait that has many commonalities to this is grit and encompasses a passionate goal of pursuing long-term goals despite the challenges and obstacles (Schmidt, Fleckenstein, Retelsdorf, Eskreis-Winkler, & Möller, 2019). Individuals with a high trait grit-level report to have more perseverance, more self-confidence, resilience, and self-efficacy, which contributes to reducing psychological problems (Datu, Yuen, & Chen, 2017; Jin & Kim, 2017). While trait grit may seem positive, it also has a detrimental effect where individuals may have too much grit in which they are very insistent on something, unable to set their boundaries properly and therefore not take good care of themselves (Vertommen, Laureys, Stockman, Verhelle, & Aga, 2020). For example, 97% of students experience stress due to the pressure of performing to achieve their goals (Ministry of Education, Culture and Science, 2021). Furthermore, young top athletes, who may have high levels of grit, consider their sport and their performance to be so important that they are unable to set their limits when it comes to physical or emotional abuse (Vertommen, Laureys, Stockman, Verhelle, & Aga, 2020). So, it seems that people with high levels of grit are not always able to take care of themselves, which makes their mental health seem out of balance. A personality trait in which self-care is important is self-compassion. This trait activates the health care system within the body and provides a calm, flexible and supportive mode (Gooren, 2021). People who are

self-compassionate are generally kinder to themselves, stand up for themselves, are allowed to make mistakes, and take better care of themselves and others. Mental problems decrease and well-being and resilience increase when someone experiences a lot of self-compassion on average (Neff, 2015; Gooren, 2021). Neff (2003) defines trait self-compassion as: 'A compassion turned inward which refers to how we deal with ourselves in instances of perceived failure, inadequacy, or personal suffering". Furthermore, people high in self-compassion report to be more (intrinsic) motivated to achieve goals, to learn from mistakes and taking personal initiative (Breines & Chen, 2012). The degree of self-compassion is studied in a randomized controlled trial study, showing that individuals reported an average degree of self-compassion (Neff & Germer, 2012). Based on the positive associations of self-compassion, it can be the case that increased self-compassion may well balance the mental health of people with high levels of grit.

However, little literature is known about the relationship between self-compassion and grit, how these are constructed at state level and how they fluctuate in everyday life. It seems that being gritty is an important characteristic for Generation Y. Nevertheless, this generation, who experience a lot of grit, seems out of balance because they are stressed and can set few boundaries, so they do not seem to take good care of themselves. This contextual factor can be explored in daily life to better understand the imbalance and to design tailor-made mental health interventions. Therefore, research into the state-level of self-compassion and the trait level of grit is important to provide insight into the extent to which students feel self-compassionate when they experience a certain degree of grit (i.e., to understand whether grit predicts the degree of self-compassion). Furthermore, because of the disbalance, it is assumed that these constructs vary quite a bit within a person. In general, psychological constructs can show significant variation at the intrapersonal level (McGuire, Szabo, Murphy, & Erickson, 2019), so research into the processes within persons is important, but is not common in the literature (Wichers, 2013). According to Curran and Bauer (2011), a study in which a series of measurements are collected multiple times in a sample, is very informative about differences

at a between-persons level and at a within-persons level. Only examining one level of this more complex two-level effect would limit the development of a full understanding of the relationship between grit and self-compassion (Curran & Bauer, 2011). Furthermore, substantive theories about within- and between-person effects assume effects at both the individual and group level (Curran & Bauer, 2011). Therefore, it is valuable to investigate the influences of a group on the within-person association between the constructs. Therefore, the difference in the within-person association between state self-compassion and state grit in a group of individuals with high or low levels of grit can be examined. In particular, a lot of research is done into the processes between persons using cross-sectional studies, where single-time point measures were used and no fluctuations were recorded (Montag, Duke, & Markowetz, 2016). While this research method does allow for an overall picture of how one reflects about oneself based on the measured construct, it may be subject to false memories or biased perceptions of past events (Montag, Duke, & Markowetz, 2016). To overcome these limitations and to measure grit and self-compassion within-persons in daily life, the experience sampling methodology (ESM) can be used. ESM includes multiple measurement moments per day over several consecutive days, in which participants have to answer questions in their daily lives about their actual mental state. The importance of measurement in everyday life is that this real-life research focuses on the complexity of the experience in an ever-naturally changing and uncontrollable environment (Myin-Germeys & Kuppens, 2021). This makes it possible to examine, within a person, the possible varying experiences of psychological constructs and to understand how these constructs work in real life. Therefore, the aim of this study is to investigate the relationship between state and trait levels of self-compassion and grit in everyday life, by using ESM.

Self-compassion

Compassion literally means ‘’to suffer with’’. Self-compassion is an inward-looking compassion and consists of a sensitivity to the experience of suffering, associated with a deep desire to alleviate that suffering (Neff & Dahm, 2015). Neff (2003) encompassed self-compassion in three

main elements: (1) *self-kindness* (i.e. being supportive, understanding, gentle, and encouraging towards ourselves), (2) *common humanity* (i.e. not labeling happy or painful experiences personally, but as something of all people, recognizing that no one is perfect and making mistakes is part of life), and (3) *mindfulness* (i.e. becoming aware of negative thoughts and emotions so that they are approached in a balanced and even-tempered way). The self-compassion scale short form (SCS-SF) of Neff (2003) is used to measure self-compassion on a trait level. It is a self-report measure consisting of 26 items, divided into six subscales: self-friendliness, self-judgment, communal humanity, isolation, mindfulness, and over-identification. High trait levels of self-compassion indicate that individuals can look at and reflect on themselves in a friendly and warm way, and that they can limit their own suffering. Low trait levels of self-compassion can result in a fear of self-pity and a low ability to accept weaknesses (Neff, 2003).

Self-compassion at the state-level is measured by Breines and Chen (2012) and shows that self-compassion in daily life can be increased by different strategies, like recalling a friend. Chishima, Mizuno, Sugawara, and Miyagawa (2018) shows more possible factors that can influence self-compassion in daily life, such as a person's emotional state, coping styles, cognitive assessments, and current life events. A recent study from the University of Twente measured state self-compassion in daily life by using one developed question based on the trait questionnaire SCS-SF (Wallisch-Prinz, 2020). This study indicates that higher levels of trait self-compassion are weakly associated with higher levels of state self-compassion.

Grit

Sturman and Zappala-Piemme (2017) defined grit as follows: ‘’To sustain a focused effort to achieve success in a task, regardless of the challenges that present themselves, and the ability to overcome setbacks’’. Research shows that when individuals have a high degree of grit, they are more persistent and more willing to achieve their goals, and therefore their well-being increases (Salles,

Cohen, & Mueller, 2014). Additionally, a study from Musumari et al., (2018) shows a negative correlation of grit with poor mental health outcomes, particularly depression and anxiety.

To measure Grit on a trait-level, the 12-item Grit Scale for Children and Adults (GSCA) can be used (Sturman & Zappala-Piemme, 2017). A longitudinal study of college students has shown that persons who are classified as high in the trait grit experience a near absence of suicidal ideation by increasing their meaning of life (Kleiman, Adams, Kashdan, & Riskind, 2013). Wong & Vallacher (2017) measured grit in everyday life, and defined state-level grit as sustained perseverance over a long period of time. A previous study from the University of Twente also measured grit on a state level by using two questions from the trait questionnaire GSCA (Arjomand, 2020). Higher levels of trait grit seem to associate moderately with higher levels of state grit.

Self-compassion and grit

There are no known studies measuring both self-compassion and grit. However, there is a study about the relationship between self-compassion and motivation, as motivation is an important aspect of the construct grit. Neff and Dahm (2015) showed that individuals with high self-compassion are highly motivated, but for the reason that they care about themselves. Another study showed that individuals high in self-compassion have less fear of failure and are more likely to try things again if they didn't succeed the first time (Neely, Schallert, Mohammed, Roberts, & Chen, 2009). Based on this, it seems that people with high levels of self-compassion also have high levels of grit. This seems to mainly concern individuals who have a high degree of state self-compassion in daily life and who are very driven to keep it that way and who do not give up easily.

Current study

Generation Y is characterized by trait grit, but they may even experience too much grit. Research shows that students are, on average, self-compassionate. However, these constructs seem to vary because they experience stress and are unable to set their boundaries properly, which has a negative impact on their mental health. This variation is examined in the daily lives of students by

using an ESM, examining the relationship between state and trait constructs, the between-person and within-person association, and the variation of the within-person association between the two state constructs in a group with high or low levels of grit. For this study, the following main question was formulated: *Exploring the within-person association between state grit and state self-compassion over time in daily lives of students: How are these constructs associated?* Three sub-questions have been formulated to answer the main question.

1. What is the relation between average state self-compassion and trait grit?
2. What is the between-person and the within-person association between state grit and state self-compassion?
3. Is the within-person association different based on high or low trait levels of grit?

Methods

Participants

The study included a sample of 30 students mainly from the University of Twente (UT) from the Faculty of Behavioural, Management and Social Sciences (BMS), with ages ranging from 18 years to 35 years (M_{age}= 22.6, SD_{age}= 3.82, female 50% and male 50%). The participants were of Dutch nationality (43.3%), German nationality (30%) and other nationalities (26.7%). They were recruited by means of convenience sampling; through university of Twente's BMS faculty SONA (subject pool software) system and the researchers' own personal contacts. The BMS Faculty participants were compensated with one SONA credit for completing the study. To be included, participants had to be at least 18 years of age, be proficient in the English language, and required a smartphone that is able to download the application Ethica which is utilized for this study.

Materials

The online survey was built and implemented using the application *Ethica.* The test battery consisted of two daily state questions and one trait questionnaire. Ethica is a software environment used to design and deploy different types of studies. The participants can participate in the study via this platform on their smartphone. It enables the researchers to recruit participants, adapt the research if necessary, and track, view and secure the data via a web desktop environment. The application can be installed on smartphones with Android and IOS operating systems. Ethica version 153 was used in this study. This made it possible to ask the participants questions using different trigger logics, such as a fixed time of publication. Pop-up notifications can be scheduled as a reminder to participants when a particular activity (e.g., survey) needs to be completed.

Trait measures

The SCS-SF is a 12 items questionnaire (appendix A) and measures self-compassion on a trait level (Raes et al., 2010). For each statement, participants indicated to what extent they act towards themselves during difficult moments on a 5-point Likert scale (1=almost never; 5=almost always). SCS-SF measures six facets of self-compassion: (1) *self-kindness* (e.g. “When I’m going through a very hard time, I give myself the caring and tenderness I need”), (2) *self-judgement* (e.g. “I’m intolerant and impatient towards those aspects of my personality I don’t like”), (3) *common humanity* (e.g. “I try to see my failings as part of the human condition.”), (4) *isolation* (e.g. “When I fail at something that’s important to me, I tend to feel alone in my failure”), (5) *mindfulness* (e.g.” When something painful happens I try to take a balanced view of the situation.”) and (6) *over-identification* (e.g. “When I fail at something important to me I become consumed by feelings of inadequacy). De facets self-judgement, isolation and over-identification are negative facets of self-compassion and therefore have to be reversed. The level of self-compassion is determined by the composite scores, with higher scores indicating a higher level of self-compassion. The scale is factorially validated, the

correlation between the composite scores of the short and long form of the questionnaires is r = .97 and internal consistency of α=.86 (Raes et al., 2010).

The GSCA defines trait grit as an ongoing effort to achieve goals despite its challenges (Sturman & Zappala-Piemme, 2017). The scale consists of 12 items (Appendix B) that can be answered on a 5-point Likert scale (1= totally disagree; 5= totally agree). "Challenges in my life sometimes make me stop trying" is a sample item on this scale. The level of grit is determined by the composite scores, with higher scores indicating a higher level of grit. The scale shows sufficient internal consistency (Cronbach's alpha of 0.84), as well as high construct and criterion validity, and a high correlation with self-efficacy compared to other existing grit measures (Sturman & Zappala-Piemme, 2017).

State measure

To measure state self-compassion and state grit, a *daily questionnaire* was conducted which can be found in Appendix C. As described in the introduction, few studies have measured self-compassion and grit at state level. Based on this literature, the state levels will be measured in this study.

To measure state self-compassion, one item was chosen from the SCS-SF. This question is formulated based on the subscales of self-kindness and common humanity, as it was weakly positive correlated with the SCS-SF (Wallisch-Prinz, 2020), and was answered by the participants on a 5-point Likert scale. To measure state Grit, two items of the GSCA were chosen. In a recent study from the University of Twente (Arjomand, 2020), these two questions were chosen based on their high factor loading and how well they could be adjusted to fit the state conceptualization of self-compassion.

Design and Procedure

For this study, a longitudinal correlational research design was used by means of the experience sampling method (ESM). Prior to the study, there was a two-day pilot with two

participants testing the functionality of the questionnaires, notification messages, response features and user interfaces on Ethica. The study itself spanned a nine-day period. At the beginning of this period, the participants were given the task of downloading the Ethica application and filling in a study code. They then obtained information on Ethica about the study, what was expected of them, and they had to give their consent to participate in the study. In addition, the participants had to fill in their demographic information and they had to enable the notification functions so that they can receive a message on their mobile phone when, for example, a questionnaire is ready for them. The importance of this was indicated by an explanation of how they could turn this feature on. On the first day, participants had to complete the trait questionnaire on self-compassion, which consisted of 12 questions. It was important that this questionnaire was completed before the daily questionnaires were opened. Therefore, the trait questionnaire closed at 11:30 am that day with the aim of avoiding possible influences on the trait measurement. Over the next eight days (days 2 to 9) participants were given three state questions that were merged into the daily questionnaire. This daily questionnaire was available for the participant on three different time frames, in the morning (9-10:30), afternoon (14-16:30) and evening (20-21:30). The times of availability were chosen randomly to avoid habitual responses from the participants. After 90 minutes, the availability of the questionnaire expired, and it could not be completed again. Answering the questions was mandatory and the next question was not opened until the previous question was answered.

The response of the participants was monitored during the study. Researchers contacted participants who had not answered questions for several consecutive days. The aim was to increase the effort of participation and to encourage them to continue the research. At the end of the study (day 9), all participants were thanked for their efforts.

Data analysis

To analyze the data, IBM SPSS Statistics 28 was used. First, descriptive statistics were run to get an overview of the demographics of the participants and for the respective trait and state scores of

grit and self-compassion. Therefore, the means, the standard deviations and the correlations were calculated. Furthermore, state data were aggregated per participant (person mean, PM), and these PM's were subtracted from each individual's time-specific score to receive a person mean centered score (PMC). Furthermore, the trait levels of the construct grit and self-compassion were categorized into a high (>50 percentile), and low (<50 percentile) category.

To answer the first sub-question, a Pearson correlation was utilized to see the relationship between average state self-compassion and trait grit, and were considered weak (>.10), moderate (>.30) or strong (>.50) in line with the criteria by Cohen (1987). To take into account multilevel data, fixed and random effects in ESM studies, an autoregressive linear mixed model (LMM) is used for further analyses (Myin-Germeys & Kuppens, 2021). The variables in this model were standardized in order to aid in interpreting the within and between person parameter estimates.

To answer the second sub-question, a LMM was incorporated to understand whether the relationship between self-compassion and grit is a state-like (within-person) or a trait-like (between-person) association. In this analysis, state self-compassion was set as the dependent variable, while state grit PM (between-person) and state grit PM-centered (within-person) were set as fixed independent variables. The analysis in this direction can be used to investigate whether the degree of grit is related to the degree to which people feel self-compassionate. To visualize the within-person and between-person associations, line plots were created for a few participants per measurement point over one week. To answer sub-question three, a LMM was run using state self-compassion as dependent variable and state grit and the category of trait grit as independent variables. Because the group of trait grit is divided (low/high), this analysis investigates whether the within-person association between state grit and state self-compassion differs in a group with people with a low trait grit or in a group with people with a high trait grit. First, only participants in the low trait grit group were included. Subsequently, a LMM was run with state self-compassion as dependent, and state grit as independent variable. Then, this LMM was performed again, with only those participants included

in the high trait grit group. Furthermore, line plots were created to visualize the development of state grit in each trait level category across all measurements.

Results

Descriptive Statistics

In total, 43 participants entered this study, of which 13 participants were excluded due to low response (i.e., below 50%), and their data was deleted. There was a response rate with an average of 76.94%. First, the total scores were calculated for each variable, which serves as the basis for further analyses. Then, the means, standard deviations, minimum and maximum scores of the trait and state questionnaires were measured. This overview can be found in Table 1. Both trait variables were normally distributed but were slightly skewed to the left. Both state variables were normally distributed as well but were slightly skewed to the right. Based on the categories for both trait constructs, $n = 16$ participants were categorized as 'low', and $n = 14$ participants were categorized as 'high'.

Table 1
Minimum and Maximum Scores, Means and Standard Deviations of Traits Grit and Self-Compassion

Variables	Mean	Std. Deviation	Minimum score	Maximum score
Trait Grit	3.14	0.50	1	5
Trait Self-compassion	3.22	0.59	1	5
State Grit	3.26	1.12	1	5
State Self-compassion	3.44	0.89	1	5

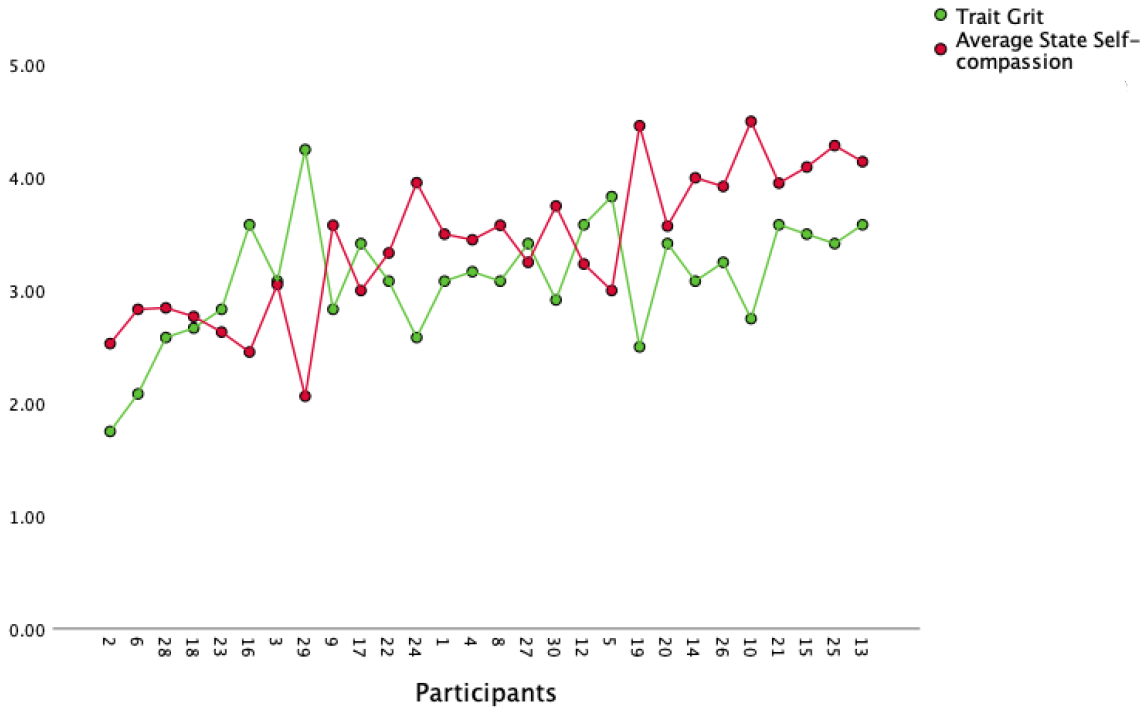
N=30

Data analysis

The Pearson correlation between trait grit and average state self-compassion showed a weak positive correlation ($r = .106$, $p < .01$). This indicates that trait grit has weak linear relationship with average state self-compassion. Figure 1 is a visualization of this correlation. Except for the first two points, the pattern is mirrored. It can be seen from this figure that when trait grit is increased, the mean of state self-compassion is also increased. It is also striking that the degree of self-compassion in almost everyone is greater than trait grit.

Figure 1

Average State Self-compassion and Trait Grit per Participants



State Grit and State Self-compassion

To answer the second sub-question, a LMM was used to investigate whether state grit predicts state self-compassion. The LMM was run with state self-compassion set as the dependent variable, while state grit PM (between-person) and state grit PMC (within-person) were set as fixed

independent variables. This analysis indicates in a weak positive within-person association between self-compassion and grit, and a moderate positive between-person association between self-compassion and grit (Table 2). This means that state self-compassion can be better predicted by a person's average grit for that week, than their momentary grit. Thus, participants with higher grit scores on average in a week than others have higher self-compassion scores on average than others. Figure 2 shows this result, with participant 19 scoring high on grit during the week in which his self-compassion also increased. It is striking that there is a very wide confidence interval of the person's mean estimate. This means that the state of self-compassion cannot be predicted for everyone by the average grit score for that week. Therefore, participants showed different patterns of state grit and state self-compassion. An example can be seen in Figure 3. Participant 20 shows an unexpected pattern where low scores of state grit are measured, and state self-compassion also appears to have low scores. In moments in which grit rose, self-compassion increased as well. Another example can be seen in Figure 4, where the two states differ and have no clear pattern. When participant 23 experiences low levels of grit, the levels of self-compassion decrease and increase at different moments in time.

Table 2

Parameter Estimates of State Grit on State Self-compassion

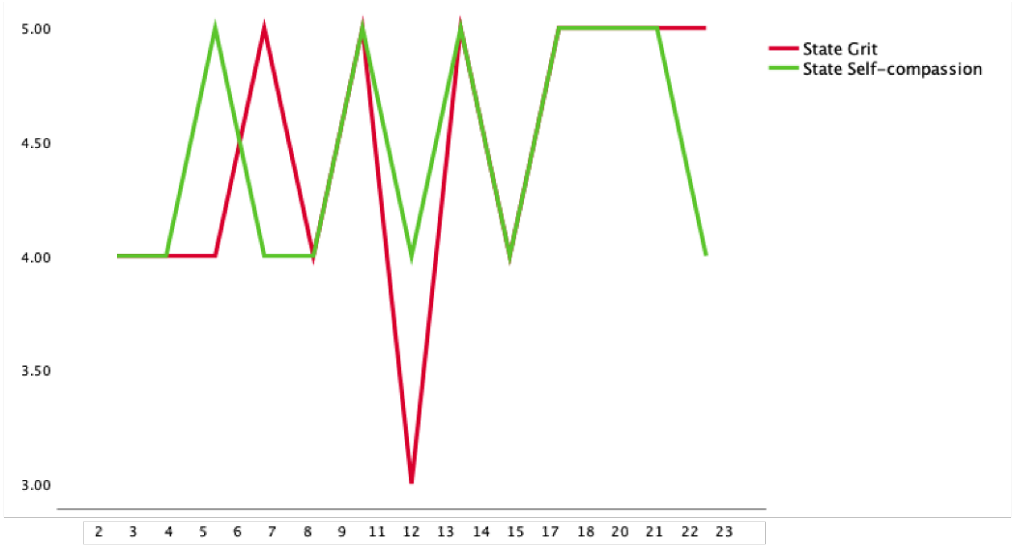
Parameter	a β	Std. Error	t (df)	p	95% CI		F
State Grit (PM)	.41	.17	2.42 (28)	.02*	.06	.76	5.87
State Grit (PMC)	.06	.03	2.08 (522)	.04*	.00	.12	4.35

a β = standardized beta coefficient.

* $p < .05$

Figure 2

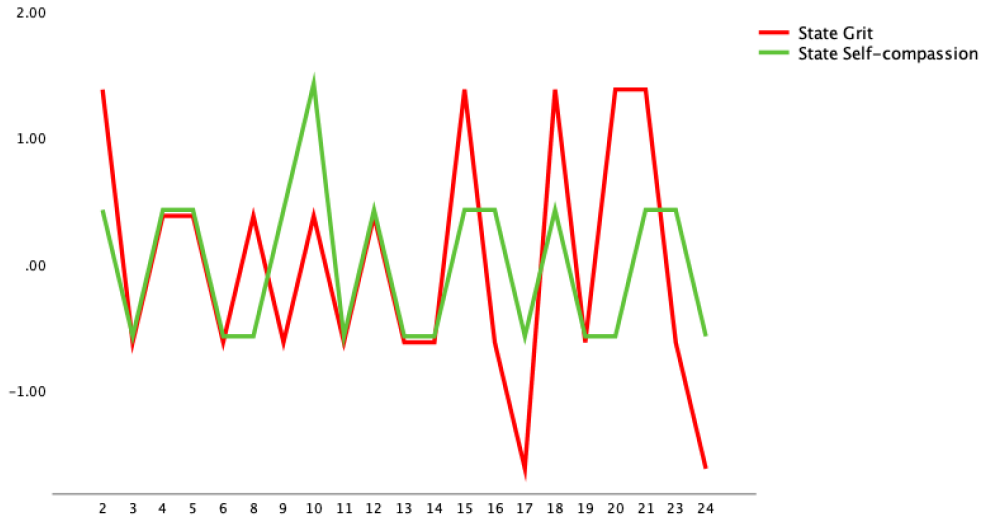
State Grit and State Self-compassion of Participant 19 across One Week



Note. Participant 19 misses a number of measurement moments, such as 1, 10 and 24.

Figure 3

State Grit and State Self-compassion of Participant 20 across One Week



Note. Participant 20 misses a number of measurement moments, such as 1, 7 and 22.

Figure 4

State Grit and State Self-compassion of Participant 23 across One Week

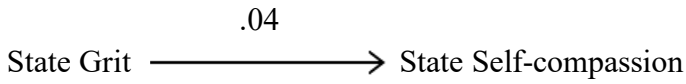
Note. Participant 23 misses a number of measurement moments, such as 1, 10 and 24.

The association between state self-compassion and state grit slightly differs between the trait levels of grit (Figure 5). Therefore, sub-question three can be answered by exploring the interaction effect with a LMM. The LMM was run with state self-compassion as a dependent variable, state grit as predictor, and categorized trait grit (low/high) as factor. The analysis showed that there was a significant interaction effect between the category of trait (low/high) grit and state grit in association with state self-compassion, $\beta = 2.23$, $SE = 1.11$, $p = .04$, 95% CI [.17, 4.28]. Then, separate analyses were run for the categories low and high trait grit. The results show that the low trait grit group ($\beta = .04$, $SE = .05$, $p = .36$, 95%, CI = -.05, .13) and the high trait grit group ($\beta = .12$, $SE = .04$, $p = .007$, 95%, CI = .03, .20) overlap in the confidence interval. This means that there is insufficient evidence to conclude differences in the intrapersonal associations between the two groups. The results of this analysis should therefore be interpreted with caution. Both analyzes appear to be weak and could yield different results in a subsequent analysis.

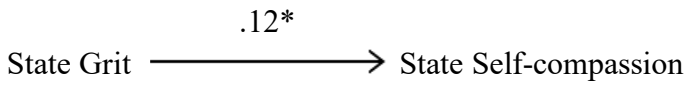
Figure 5

Differences in Association between State Grit and State Self-compassion per Trait Category

Low Trait Grit



High Trait Grit



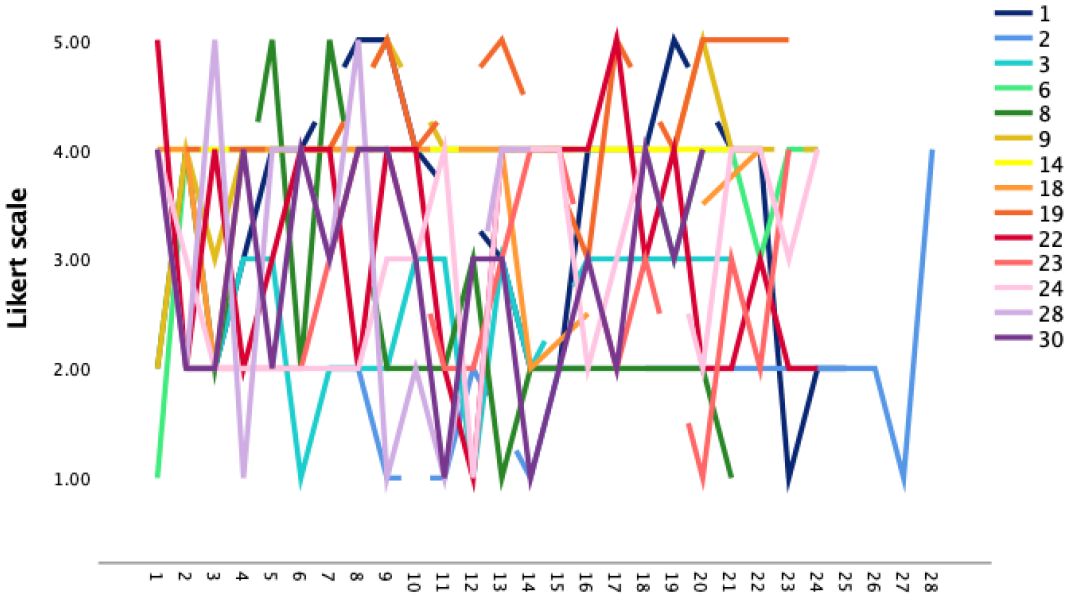
$*p < .05$

Figure 6 shows a clear picture of the relationship between state grit and state self-compassion within the trait groups of grit (low/high) in daily life. The low trait grit group was more dispersed across the mid-levels of state self-compassion. However, four participants achieved the maximum level of self-compassion, with one participant achieving this level five times. Compared to the other groups, the fluctuations were less extreme. Participants in the low trait grit group more often achieved the highest levels of state grit compared to state self-compassion. In contrast to the participants in the low trait grit group, the participants in the high trait grit group more frequently reached the lowest level of self-compassion. In addition, Figure 6 also shows that most participants achieved average to high scores on state self-compassion at the start of the study, after which they descend later. For this, there seems to be no pattern for the state level of grit. Participants with high or low trait grit levels are both fluctuating in state grit, with participants with high trait grit fluctuating more extremely.

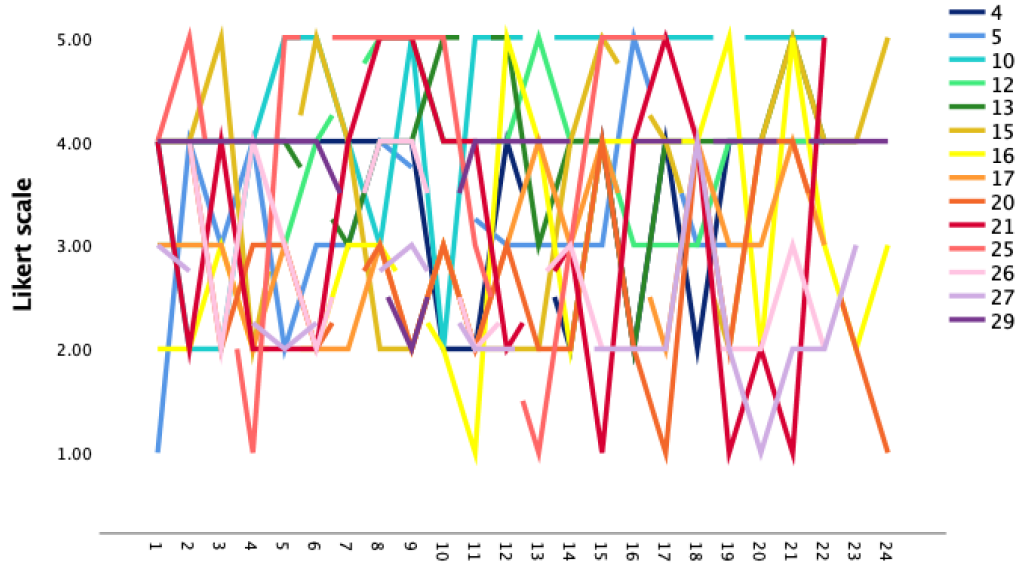
Figure 6

State self-compassion of Participants Low and High in Trait Grit in Daily Life

Low Trait Grit - State Grit



High Trait Grit - State Grit



Discussion

This study aimed at investigating the association between grit and self-compassion in students' daily life. Therefore, the two variables were examined, investigating the association between average state self-compassion and trait grit. Furthermore, the associations on the between- and within-person level were disaggregated from each other, and it was investigated whether trait grit influenced the within-person associations of self-compassion and grit. The main result is a moderate positive between-person association between state self-compassion and state grit, and a weak positive within-person association between the two state constructs. This means that state self-compassion can be better predicted by a person's average grit for that week than by their state grit. State grit and state self-compassion were positively associated on the within-person level. In the groups high trait grit and low trait grit, there seems to be a weak association between grit and self-compassion. Because both groups overlap in the confidence interval, there is no sufficient evidence to conclude that the two groups differ in the intrapersonal association between grit and self-compassion. It is possible that the study will yield different values in a repeated study and the current results should be interpreted with caution. Lastly, the results showed that average state self-compassion is weakly positive associated with trait grit. This means that when the level of trait grit goes up, the mean of state self-compassion goes up slightly as well.

Average state self-compassion and trait grit

In this study, it was observed that many participants experience high levels of grit. Nevertheless, a small positive association was found, and the participants seem to experience more self-compassion on average when they have a high degree of grit. As a result, it could be expected that people who experience more grit also continue to take good care of themselves due to the increased degree of self-compassion. This finding is in line with the self-determination theory of Ryan and Deci (2000). The self-determination theory states that competence, autonomy, and relatedness are three innate psychological needs that contribute to intrinsic motivation and

engagement that enhances performance and well-being (Ryan & Deci, 2000). As intrinsic motivation and grit are associated with each other (Sturman & Zappala-Piemme, 2017), grit also appears to improve performance and well-being. In addition to these three psychological needs to achieve performance and well-being with intrinsic motivation, autonomy and relatedness are also positively associated with self-compassion, whereby self-compassion leads to more self-care capacity, compassion for others, more relatedness, autonomy, and sense of self (Reyes, 2011). Within self-compassion, increased autonomy is about self-control that can be enhanced through the practice of mindfulness (Reyes, 2011), and within the self-determination theory, autonomy means that a person has his own choice and is able to be himself, i.e., an internally perceived locus of causality (Ryan & Deci, 2000). Keeping control over yourself, making your own choices and being able to be yourself, seem to be qualities that are necessary for the students in this study who experience a high degree of grit and contribute to achieving goals while still taking good care of themselves. Relatedness is defined within self-compassion as a degree of connectedness whereby actions in the world and in the community are performed to help others (Reyes, 2011), and is defined within self-determination theory as a need to feel belongingness and connectedness with others (Ryan & Deci, 2000). Research shows that when people experience a sense of security and belonging, intrinsic motivation is more likely to flourish, which increases well-being (Ryan & Deci, 2000).

Besides the fact that relatedness and autonomy of the students was not investigated in this study, they seem to be important factors in both the degree of grit and the degree of self-compassion and can improve performance and self-care. This could mean that when there is insight into the relatedness and autonomy of students, these qualities positively influence the degree of grit and self-compassion. This also seems to fit with the weak positive association between grit and self-compassion and it could mean that characteristics such as autonomy and relatedness are an interaction factor for this association.

Between-person and within-person association between state grit and state self-compassion

In this study it was found that state self-compassion can be better predicted by a persons' average grit for that week than by their state grit, because of the moderate positive between-person association and a weak positive within-person association between state self-compassion and state grit. According to Curran & Bauer (2011), this data of disaggregated levels of effect provides the opportunity to identify within-person relationships as well as between-person relationships. A series of measurements taken at several times of several individuals contain information about both interpersonal and intrapersonal differences. When only one level was measured, it would have limited the development of the full understanding of the relationships and an estimation and interpretation of these data could have only been made in a rather straightforward manner (Curran & Bauer, 2011). Therefore, both levels were examined. The identification of the relationship is found in the moderate between-person association which may indicate that students with on average a high degree of grit for that week, predicts their higher state self-compassion. According to Fleeson and Law (2015), personality characteristics are considered to be stable, which may indicate that being gritty is a natural trait and students experience this on average to a high degree. Grit requires a passion for long-term goals, therefore it may seem that a person's level of grit generally remains the same over time. This is also consistent with the definition of the construct grit, where grit consists of two facets: perseverance and consistency of effort (Duckworth & Quinn, 2009). Perseverance is about the tendency to work hard and keep going despite setbacks or challenges, and consistency of effort refers to the tendency to have long-term stability in one's own goals (Duckworth & Quinn, 2009). Both facets are about stability and long terms, and therefore it is assumed that this trait shows little change over time. It seems that students are persistent and consistent and experience stable levels of grit during a week, which predicts their levels of self-compassion.

In addition to a stronger between-person association than within-person association, the results also show a wide confidence interval of the person's mean estimate. This means that the state

of self-compassion cannot be predicted for everyone by the average grit score for that week. Repeatedly assessing personality constructs in daily life shows that the variance within persons becomes larger (Fleeson & Law, 2015), which could explain the high variance of self-compassion of the between and within-person association in this study. The self-determination theory describes that three innate psychological needs contribute to intrinsic motivation, which in turn leads to better performance and well-being (Ryan & Deci, 2000). In this research, the three needs, autonomy, relatedness, and competence, have not been investigated, but they do contribute to the degree of motivation and thus their well-being. A possible explanation for the wide variation of self-compassion is that the degree of these needs is experienced to a lesser extent, causing the motivation and performance of students to fluctuate and therefore the well-being of the students varies. In addition, the degree of self-compassion can also be influenced by the type of motivation, whereby intrinsic motivation has a positive association with well-being, and extrinsic motivation has a negative association with well-being (Ryan & Deci, 2000). Research shows that tangible rewards, threats, deadlines, imposed goals, and pressured evaluations reduce individuals' intrinsic motivation (Ryan & Deci, 2000). Students with high levels of grit may experience decreased internal motivation as a result of extrinsic rewards, resulting in decreased competence, autonomy, and belonging that are part of the self-determination theory, negatively impacting self-care and well-being (Ryan & Deci, 2000). However, Johnson (in Ryan & Deci, 2000) points out that individuals are motivated by various factors, both extrinsic and intrinsic, and that this is a matter of norms and values and the meaning of culture. So it may be that students with a high degree of grit, can be motivated by intrinsic motivation as well as extrinsic motivation, depending on their culture. Therefore, an explanation for the wide confidence interval could be that students who experienced high levels of grit, either internally or externally driven, experienced reduced well-being, and subsequently experienced low levels of self-compassion.

Within-person association between grit and self-compassion for high or low trait levels of grit

This study showed that state grit and state self-compassion were positively associated at the within-person level. Grit and self-compassion seem to associate weakly in both the high trait grit group and the low trait grit group. The confidence intervals of the two analyzes overlap, which means that the strength of the associations can vary with repeated studies. This means that there is insufficient evidence to conclude that the two groups differ from each other, i.e., that the values of the confidence intervals differ in the two groups. Because there are two weak associations, it means that there seems to be little correlation between the group (high or low) and the association between grit and self-compassion. It seems that a group of students with, for example, high grit has no influence on the association between grit and self-compassion. According to the broaden-and-build theory (Fredrickson, 2001), positive emotions broaden momentary thought–action repertoires which in turn build individual's personal resources, such as new discoveries of creative actions, ideas, and social bonds. Positive emotions therefore help to gain more grip on situations, improve flexibility, and find new possibilities, as a result that a person becomes more sensitive to his surroundings, and improves his understanding of what is actually happening (Fredrickson, 2001). As gritty students have an increased well-being and feel a lot of passion, it could be expected that these positive emotions would enhance students' attention span and therefore help to build resources, including more love and compassion for themselves. Despite the positive emotions resulting from the level of grit, there does not appear to be an increased attention span, whereby no strong association in a group of students with a high level of grit was found. Based on this, it is assumed that when examining the association between grit and self-compassion in, for example, a group of top sports athletes (high grit) no change in the association between grit and self-compassion would be found. It is therefore expected that the relationship between grit and self-compassion in different populations such as students, top sport athletes or other groups with high or low average trait grit should differ little from each other.

Strengths and Limitations

Through the use of ESM, a number of advantages have been found in this study. Understanding how one reflects on oneself based on a measured construct may involve false memories or a biased perception of past events (Montag, Duke, & Markowetz, 2016). Because the data was collected at different points in time, this limitation was overcome. In addition, the data was collected in everyday situations via an already natural action for students, namely via the mobile phone, which increased the ecological validity of the study. In addition, this method made it possible to distinguish between relationships between persons and within persons, allowing for a differentiated interpretation of the relationships. In order to obtain within-person and between-person fluctuations in this study, it was important that the study focused on the complexity of experiences in an ever-changing and uncontrollable environment (Myin-Germeys & Kuppens, 2021). The data collected from the study have a higher ecological validity than cross-sectional data. In addition to the strengths of this study, limitations were also found that should be mentioned so that they can be taken into account in future research. A limitation of this study lies in the categorization of trait grit, in which a division is made in percentages, with the lowest 50% being placed in the 'low' category, and the highest 50% in the 'high' category. In this study, many individuals were around 50% and were therefore close to each other in terms of score. Yet, they are subdivided into a group that is opposed to the other group. An optimization for this was to also create a 'middle' category, which would have resulted in a clearer division in the groups. Because the study size was small (N=30), many individuals fell into the middle group and no clear distinction could be made between people high and low in trait grit. In future research, larger samples could be used so that distributions based on the trait levels have more cases and the analyzes contain greater statistical power. Little is known about the statistical power analysis to justify sample size in ESM research (Trull & Ebner-Priemer, in Myin-Germeys & Kuppens, 2021). However, to determine the sample size, the PowerAnalysisIL app can be used in which a simulation-based power analysis is performed beforehand (Myin-Germeys &

Kuppens, 2021). A larger sample size would allow for a clearer distribution in the trait groups, with a base of low (<25%), middle (26-74%), and high (75>).

Furthermore, in this study the construct grit is also defined by Schmidt, Fleckenstein, Retelsdorf, Eskreis-Winkler, and Möller (2019). Although this definition is cited in several studies, this definition may differ between individualist and collectivist cultures as the definition appears to be non-universal (Abu Hasan, Munawar, & Abdul Khaiyom, 2020). A limitation is therefore that participants of this study have different ideas, experiences and meaning with this non-universal definition and have subsequently answered a different construct. If the definition had fit the participants' culture, the meaning of grit would have been the same and the participants would have responded to the same construct. In future research, especially in other cultures, the definition of grit should be reconsidered.

A final limitation of this study is that it is not clear whether the constructs are convergently valid and whether they were reliable. According to Myin-Germeys and Kuppens (2021), validity in an ESM study refers to the extent to which the data, information, or conclusions accurately match the real world. Reliability can be operationalized as the percentage of variance in answers due to true variance as opposed to random errors. Within ESM studies, the construct is expected to change regardless of the repeated measures. For this reason, reliability is operationalized as internal consistency and a distinction is made between the reliability of assessing within-person and between-person differences (Myin-Germeys & Kuppens, 2021). Both are important, because the state levels are based on the trait constructs and thus formed the basis for this study. Future follow-up research could include this in the analyzes to ensure that the constructs used are reliable and valid.

Future Directions

As mentioned earlier, self-compassionate people are intrinsically more motivated to achieve goals, learn from mistakes, and take personal initiative (Breines & Chen, 2012). In future research it may be interesting to investigate whether grit can also be predicted by the degree of self-compassion

in daily life. Students indicate that they experience happiness about their future (Suar, Jha, Das, Alat, & Patnaik, 2020), but at other moments they indicate that they experience a lot of stress and feel pressure to perform (Ministry of Education, Culture and Science, 2021). Self-compassion thus seems to vary in daily life and for this reason it is also interesting to investigate this construct with an ESM study.

In the discussion on the relationship between state self-compassion and trait grit, it has become clear that other factors may explain the association between grit and self-compassion, such as autonomy and relatedness. These factors both have a positive influence on intrinsic motivation and well-being (self-determination theory) but are also associated with self-compassion and mindfulness (Reyes, 2011; Ryan & Deci, 2000). In addition, other factors have emerged that may explain the wide confidence interval in the between-person and within-person association between grit and self-compassion. It is assumed that the type of motivation can play a role in the degree of self-compassion, because extrinsic motivation can lead to a lower well-being (Ryan & Deci, 2000). It should be noted that this may depend on culture.

Conclusion

This ESM study contributed to the research on the relationship between grit and self-compassion of students in their everyday context by looking at state and trait levels, and at the relationship of these constructs between persons and within persons. The mean level of grit within students is associated with an increase in students' daily self-compassion levels. This degree of state self-compassion is better explained by a student's average grit per week than by their momentary grit. At the intrapersonal level, there was a weak association, even when examined within a high or low trait grit group. Therefore, no intrapersonal differences were found between grit and self-compassion when they experience a high or low degree of trait grit. The degree of stress that students experience mainly due to pressure to perform and the effort to set limits for individuals with high performance pressure cannot be directly explained by the results of this study, because the degree of self-

compassion is slightly positively associated with the degree of grit. Nevertheless, this imbalance may be explained by extrinsic motivation associated with lower well-being and by cultural differences in motivation and performance. In addition, experiencing autonomy and relatedness could also play an important role for both the degree of grit and self-compassion. Future ESM research can investigate whether self-compassion can be better explained by possible other factors of performance pressure.

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Appendices

Appendix A: Self-Compassion Scale - Short Form (Raes et al., 2011)

1. *When I fail at something important to me, I become consumed by feelings of inadequacy.
2. I try to be understanding and patient towards those aspects of my personality I don't like.
3. When something painful happens, I try to take a balanced view of the situation.
4. *When I'm feeling down, I tend to feel like most other people are probably happier than I am.
5. I try to see my failings as part of the human condition.
6. When I'm going through a very hard time, I give myself the caring and tenderness I need.
7. When something upsets me, I try to keep my emotions in balance.
8. *When I fail at something that's important to me, I tend to feel alone in my failure.
9. *When I'm feeling down, I tend to obsess and fixate on everything that's wrong.
10. When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.
11. *I'm disapproving and judgmental about my own flaws and inadequacies.
12. *I'm intolerant and impatient towards those aspects of my personality I don't like.

* *Items with reverse scoring*

Appendix B: Grit Scale for Children and Adults (GSCA) items

1. *I don't always work as hard as I can.
2. I always finish what I start.
3. *I am not always motivated to do my best.
4. I always stick to the task I am working on until it is complete.
5. I always keep working for what I want even when I don't do as well as I would like to.
6. *Sometimes I am not as focused on my work as I would like to be.
7. *Challenges in my life sometimes make me want to stop trying.
8. No matter what happens to me I will be okay.
9. I always pay attention to what I am working on to make sure I do it well.
10. Sometimes I don't care about my work as much as I should.
11. I never give up even when things get tough.
12. I am able to get through tough times without any difficulty.

* *Items with reverse scoring*

Appendix C: Daily Questionnaire

1. I always stick to the task I am working on until it is complete. (scale 0-5)
2. Sometimes I don't care about my work as much as I should. (scale 0-5)
3. How kind do you feel towards yourself right now? (scale 0-7)