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RESEARCH PAPER

Grit and Different Aspects of Well-Being: Direct and Indirect Relationships via Sense of Coherence and Authenticity

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Abstract Grit, passion and perseverance for long-term goals, is strongly related to success in goal attainment even under challenging circumstances. We investigated how grit relates to three aspects of well-being: psychological well-being (PWB), satisfaction with life, and harmony in life. This relationship is approached through organismic valuing theory, which proposes that people are naturally motivated to grow towards their highest potential; grit is proposed as being akin to such growth motivation. In two studies (Study 1 with 196 university students, and Study 2 with 396 non-students), direct and indirect (mediating) effects between grit and well-being were investigated. Sense of coherence (SOC) and authenticity were used as mediators, and gender as a moderator. Grit was positively related to all well-being factors, and SOC and authenticity were significant mediators (complementary for PWB and indirect-only for satisfaction with life and harmony in life). This suggests that grittiness in goal pursuits requires both a sense that the world is coherent and an authentic connection with the self in order for it to fully benefit well-being. No gender moderation was found.

Keywords Grit · Psychological well-being · Life satisfaction · Harmony · Sense of coherence · Authenticity · Organismic valuing theory

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1 Introduction

The drive to succeed in goal pursuit has been conceptualized as the dispositional characteristic of "grit" (Duckworth et al. 2007). Grit is a motivational orientation involving "passion and perseverance to long-term goals" (Duckworth et al., 2007, p. 1087); specifically, it entails determined pursuit of a goal, despite setbacks, for years or even decades. The construct was initially conceived through investigating what sets high performers and experts apart from others. Mere IQ or talent could not explain the difference, but enduring effort with zeal for what one is pursuing seemed relevant (Duckworth et al. 2007). High grit predicts success in various situations, such as greater likelihood of having lifelong academic achievement (e.g., higher degrees; Duckworth et al. 2007); for new teachers, effectively managing their first placement at a school and better teaching performance (Duckworth et al. 2009); practicing and excelling at spelling bees (Duckworth et al. 2010); following through with tough military training (Duckworth et al. 2007; Eskreis-Winkler et al. 2014); remaining married (Eskreis-Winkler et al. 2014); and continuing with an exercise routine (Reed et al. 2013). Grit has been shown to predict success over and above the effects of IQ (Duckworth et al. 2007), hardiness (Maddi et al. 2012, 2013), self-control (Duckworth 2006; Duckworth ane Gross 2014), and conscientiousness (Reed et al. 2013), which suggests that grit differs somewhat from these constructs. For instance, unlike conscientiousness, grit has no aspects of tidiness and orderliness (Duckworth et al. 2007; Reed et al. 2013). Furthermore, grit is a future-oriented, long-term dispositional characteristic, whereas conscientiousness is a present-focused and short-term trait (Duckworth et al. 2007). Similarly, while conscientiousness is a personality trait (Big Five) and found to be quite unchanging across time (see McCrae and Costa 1990; Cobb-Clark and Schurer 2012), there is reason to believe that grit may be motivation-based and therefore able to change through intervention and behavioural choices (e.g. Tough 2013). Similarly, grit and need for achievement are related constructs, but grit differs in that a gritty individual does not require feedback—they can continue in the absence of clear indicators that their effort is paying off or even if the pursuit is not itself pleasurable (Duckworth et al. 2007, 2010).

Several other constructs (e.g. self-regulation, self-control, persistent motivation) may have some conceptual overlap with grit; however, there are a number of reasons why grit differs from these constructs. For instance, self-regulation can occur at different and often interacting levels of immediacy, from immediate (micro- and low-level) goal regulation to intermediate and long-term regulation with rising levels of abstraction with the temporal distance to the goal (Lord et al. 2010). When the time to the goal is long (months or years)—which is the case with grit—one's concept of possible selves becomes the relevant referent, and thus, interpretation of success in goal pursuit is reflected in one's self-concept (Lord et al. 2010). Drawing on this hierarchical model of self-regulation, Constantin et al. (2012) created a model of persistent motivation entailing a hierarchical goal structure comprising current purpose pursuits (i.e., immediate tasks) and long-term purpose pursuits. These types of pursuits require different levels of self-regulatory functioning in that long-term pursuits are more abstract and tap more of the person's stable personality traits, ideals, and values, whereas the current pursuits requires self-regulatory abilities for overriding distractions during immediate goal pursuit. Both pursuit types were correlated with the subcomponents of grit (Constantin et al. 2012), with a stronger correlation between grit and long-term purpose pursuit, suggesting that grit has a particular connection with long-term goals and less so with immediate self-regulation. A similar distinction was made by

Duckworth and Gross (2014) between grit and self-control: Although grit and self-control are highly related constructs, and indeed, gritty individuals are often very high on self-control, they differ in that self-control concerns overriding immediate temptations to focus on the task at hand, whereas grit entails pursuit of a superordinate goal on a longer, more abstract time-scale. Therefore, the crucial aspect of grit may be the ability to self-regulate long-range abstract goals far in the future and having passion for one's chosen goal.

Gritty people can be similarly considered "committed" to their goal, which leads to yet another related construct, commitment. Human-Vogel (2008) discussed how high-achieving students can maintain their self-regulation for study goals via commitment. Furthermore, commitment seems to be affected by one's sense of identity. However, commitment is most often studied as a domain construct detailing the psychological bonds tying, for example, employees to organizations (i.e., organizational commitment; Eisenberger et al. 2010; Nehmeh 2009) or individuals to their friends, partners, or spouses (i.e., commitment in close relationships; Rusbult et al. 2011). In contrast, grit is not considered a domain construct, but rather entails a more narrow focus of commitment to a specific long-term goal; in other words, individuals considered gritty are not necessarily committed to other pursuits or domains (see Duckworth and Gross 2014). Furthermore, grit includes an aspect of passion (Duckworth et al. 2007) that commitment does not. Grit and conscientiousness can be considered to differ in the same way: Eskreis-Winkler et al. (2014) discussed how conscientiousness is a domain trait with a variety of aspects such as tidiness, dutifulness, and striving for achievement. Grit, however, is considered a more narrow and specific aspect of conscientiousness (Eskreis-Winkler et al. 2014).

Due to its ability to predict success over and above IQ or talent, grit has gained much attention within educational intervention discussions (e.g. Tough 2013). Many educators have though to emphasize the importance of gritty effort over merely academic skill or IQ (Tough 2013). However, if grit is to serve as an important concept within educational interventions, it is crucial to understand whether it is related to higher or lower well-being. However, the research on grit and well-being is rather scarce. Singh and Jha (2008) found a significant relationship between grit and subjective well-being (SWB). Von Culin et al. (2014) looked at the subject in more depth: they found, in two studies, that highly gritty individuals are particularly likely to be motivated to seek flow experiences (i.e., engagement) and meaning. According to the approaches to happiness theory (Seligman 2002), people are motivated to pursue well-being through engagement, meaning, or pleasure. In Von Culin et al. (2014), individuals high on grit were less likely to pursue pleasure, and the authors suggested this was due to the short-term nature of pleasurable experiences, which contrasts sharply with the long-term engagement of gritty individuals.

Considering grit's potential relationship to well-being, there is a suitable theoretical framework emphasizing a long-term quest (or growth) towards one's higher potential: the organismic valuing theory by Rogers (1961, 1964). He suggested that fully functioning individuals are motivated to move towards their "true self" (authenticity), can be in touch with their own emotions, direct themselves towards meaningful goals and pursuits, and uphold prosocial values encouraging a harmonious existence with themselves and others (Rogers 1961, 1964). This view of well-being as self-actualization (i.e., growth to fulfill one's potentialities) is the basis of organismic valuing theory (Rogers 1961, 1964). Grit has similarities to that theory's notion of a natural growth motivation towards one's higher potential. Because gritty people pursue a superordinate goal requiring self-regulation on a long-term abstract level, the individual may require a rather strong connection to the self (authenticity) for the gritty pursuit to benefit well-being. In fact, given the literature on self-regulation and persistent motivation towards long-term goals—with their more

abstract quality that taps onto one's sense of identity (see Constantin et al. 2012; Human-Vogel 2008; Lord et al. 2010)—it seems likely that gritty people would require a high self-connection. Simultaneously, since the time-scale for a gritty person's goal pursuit is long, one may need a sense of support and coherence that there are resources available in that pursuit of the goal (e.g., sense of coherence, SOC). The study by Von Culin et al. (2014) in particular points to the relevance of organismic valuing theory for grit and well-being: namely, a gritty person may be motivated to pursue their highest potentials through perseverance and engagement in personally meaningful goals over a long period.

To further solidify this link, we explore how grit is related to different aspects of well-being: satisfaction with life (SWL), psychological well-being (PWB), and harmony in life (HIL). Furthermore, we are interested in determining whether these relationships are mediated by two other seemingly relevant constructs for the organismic valuing framework: sense of coherence (SOC; Antonovsky 1987) and authenticity (Wood et al. 2008).

2 An Organismic Valuing Process Framework of Grit and Well-Being

Regarding well-being, there are two research paradigms emerging from distinct Greek philosophies: hedonism and eudemonism (Ryan and Deci 2001). Hedonic well-being refers to maximizing happiness and pleasure while minimizing pain and suffering (Diener et al. 2004). Subjective well-being (SWB) is a key concept within the hedonic paradigm, referring to an individual's cognitive and affective evaluation of his/her life (Diener 1994). Grit has been found to be related to satisfaction with life (SWL) and positive affect, which are subcomponents of SWB (Singh and Jha 2008). SWL is a subjective estimation how happy an individual feels with his/her life based on that individual's own criteria (Huta and Waterman 2013). Judgments can be influenced by mood, whether one perceives oneself as having good relationships or a life purpose, or important achievements (Diener et al. 2012). Diener et al. (2012) found that satisfaction judgments on daily life are highly related to experiencing positive emotions; over the longer-term, however, a life purpose seemed to be more relevant for overall satisfaction. One means of attaining a purpose is via meaningful goal pursuits, which often require a gritty motivation (see also Von Culin et al. 2014).

The organismic valuing process and humanistic psychology's perception of the good life is perhaps more reflective of the eudemonic approach to well-being, which emphasizes the importance of growth towards excellence, growth, meaning, and authenticity (Huta and Waterman 2013). Psychological well-being (PWB) is a key concept within the eudemonic paradigm (Ryff and Singer 2008); high PWB is attained when one acquires the inner resources for maintaining well-being. Specifically, these resources are having a sense of self-acceptance, positive relationships with others, feelings of mastering one's environment, a sense of autonomy, a sense of personal growth (i.e., being constantly able to change along with fluctuations of life), and a purpose in life (i.e., feeling a connection to something greater than the self; Ryff 1989; Ryff and Singer 2008). The emphases on life purpose and personal growth distinguish PWB from other well-being concepts (e.g., SWB; Keyes et al. 2002) and suggest that PWB is highly relevant for a growth perspective of well-being. Furthermore, given that gritty individuals tend to prefer seeking engagement and meaning (or life purpose) over pleasure (Von Culin et al. 2014), grit may be strongly related to PWB.

Despite the importance of PWB and SWB, Kjell (2011) noticed that the hedonic and eudemonic theories emphasize a primary control view of well-being—namely, the locus of

control is within the self (see also Haase et al. 2012). According to both theories of well-being, a person can obtain the high well-being only while they themselves have control over their environment; in other words, they need not consider higher morals or other beings and systems (see Kjell 2011). Kjell (2011) pointed out the importance of considering secondary control—being able to release personal control and relocate the locus of control outside of the self. This means being able to accept that one cannot control everything and life will bring about fluctuations and adversities that the individual will need to adapt to (see Haase et al. 2012). Rather than adjusting the environment to meet one's own needs, one adjusts oneself to fit with the environment and to live in harmony with it, feeling little or no impulse to change that environment (Kjell 2011). Secondary control, or HIL, is similar to the notion of "existential courage" (Maddi et al. 2013, p. 132), or the ability to flexibly respond the life's changing circumstances. Additionally, it is reminiscent of a key aspect of Rogers's organismic valuing theory, namely, that a fully functioning person grows away from rigid patterns of thought and behavior and towards an ability to flexibly respond to life's fluctuating circumstances (see Rogers 1961, 1964).

By conceptualizing grit as an indicator of growth towards one's higher potential, we hypothesized that grit would be positively related to HIL. However, grit could also be seen as reflective of rigidity (i.e., an incapacity to adjust to fluctuating circumstances and change one's goals as necessary) (see Maddi et al. 2013), which opposes the flexibility required for HIL. However, currently, there is no indication that grit would reflect rigidity. Instead, high levels of perseverance and consistency of interest (the subcomponents in grit) may reflect a form of consistency with the self (i.e., identity consistency), which Daukantaitė and Soto Thompson (2014) recently showed to be highly related to different aspects of well-being.

Based on the reviewed research, we expect grit to be positively related PWB, SWL, and HIL.

3 Suggested Mediators: Sense of Coherence and Authenticity

In the interests of including the fullest picture of how grit relates to well-being, we considered two further constructs in our model as possible mediators: SOC and authenticity. SOC, according to Antonovsky (1987, 1993a), is an essential psychological resource referring to a sense that the world and oneself are *comprehensible* (i.e., a cognitive evaluation of whether everything within and around the self makes sense), *manageable* (i.e., a behavioral evaluation of using one's resources for one's benefit), and *meaningful* (i.e., the motivation to use resources for oneself and feeling that such engagement is worthy of the effort) (Antonovsky 1987; Antonovsky and Sagy 1986). Authenticity refers to feelings of a true connection to the self—that is, a transparency of emotions and their meaning to the self, understanding and following one's values, and rejecting external pressures and limitations on the self (Rogers 1961; Schlegel and Hicks 2011; Wood et al. 2008).

A sense of meaning in using one's resources seems to be shared by both grit and SOC. However, while grit is a motivation to keep pursuing one's goals, SOC is a sense that the world holds the resources one will need in such a quest. Furthermore, higher SOC is associated with resistance to giving up in the face of adversity (Pallant and Lae 2002), suggesting that SOC might be related to grit. Regarding well-being, SOC has been shown to predict various positive outcomes in life, such as higher SWL (Moksnes et al. 2013; Pallant and Lae 2002; Wiesmann and Hannich 2013), positive affect, self-esteem, and

feelings of environmental mastery (an aspect of PWB), and lower perceived stress and negative affect (Pallant and Lae 2002). Having high SOC enables one to use various psychological resources to cope with demanding situations, such taking care of a family member with dementia (Orgeta and Lo Sterzo 2013) or cancer (Tang et al. 2013); additionally, it predicts less stress and depression among patients suffering from fibromyalgia (Weissbecker et al. 2002), predicts lower school stress among adolescents (García-Moya et al. 2013), and serves as a buffer against anxiety, stress, and worry, while enhancing SWL (Gana 2001). However, while SOC has established relationships with PWB and SWL, its relationship to HIL is yet unknown. Antonovsky (1993b) discussed human life from a chaos-theoretical perspective—namely, we inevitably face difficulties that must be resolved, and a healthy way to approach said difficulties is facilitated by strong SOC. He also discussed how individuals with a strong SOC do not necessarily feel in control of their important personal resources (i.e., primary control) per se, but can trust said resources in the hands of others (secondary control), such as trusting the support of a close other. This would imply a link between SOC and HIL.

Regarding the relation between grit and authenticity, and taking an organismic valuing perspective, we suggest that individuals tend to seek authenticity in pursuing their goals, which would mean that grit would relate to higher levels of well-being with higher authenticity (i.e. self-concordance of goals; see Sheldon and Elliot (1999), Sheldon et al. 2010). However, it is also possible that someone high on grit is low on authenticity, which we would then expect to be related to lower well-being levels due to inauthentic goal pursuits. Wood et al. (2008) conceptualized the authentic personality as a disposition with three main components: (1) *authentic living*, or being able to follow one's true emotions and values and live according to them; (2) *alienation from the self*, or the fact that one who is highly authentic has a strong connection to the self; and (3) *acceptance of external influence*, or the ability to reject or resist influence of others' values. Authenticity has been shown to be related to greater feelings of self- worth, higher SWL, and less negative affect (Goldman and Kernis 2002).

People might exhibit varying state authenticity in different social roles (Robinson et al. 2012, 2014; Sheldon et al. 1997). For instance, people tend to feel more authentic with friends than with colleagues (Robinson 2009). High authenticity has also been found to be related to feelings of coherence with the self across various social situations, also known as identity consistency (see Sheldon et al. 1997). Identity consistency is particularly high in flourishing individuals (those reporting high SWB, PWB, and social well- being), and somewhat less so among moderately mentally healthy individuals (Daukantaitė and Soto Thompson 2014). Indeed, high variability in self across different roles and social situations can reduce well-being and increases stress and negative affect (Sheldon et al. 1997; Campbell et al. 2003), likely because people with low identity consistency feel it necessary to hide aspects of the self in different roles, thereby enhancing feelings of self-alienation. Thus, a consistent self-image, which relates to high authenticity, enhances well-being, and may reduce the sense of having a fragmented or alienated self. In this same vein, the fact that gritty individuals demonstrate high persistence and consistency of interest may suggest that they have high identity consistency and hence enhanced authenticity.

Relatedly, Debats et al. (1995) found that when participants were asked to describe the most meaningful events in their lives, they tended to describe events wherein they felt connected with their selves; less meaningful stories depicted feelings of self-alienation. Also, Lenton et al. (2013) found that when people described their most authentic experiences, the descriptions included mostly low-arousal positive emotional situations (satisfaction, peacefulness, helping, being creative), and reflected highly idealistic views of the

self. The authors concluded that people feel most authentic when they can act in ways that are closest to their ideal self. Therefore, it is expected that someone with high authenticity may accumulate positive emotions towards the self, and have higher well-being (PWB and SWL). Similarly, the low-arousal positivity suggests that being in touch with the self can be calming and harmonious, much like reported feelings of HIL (Kjell et al. 2015). The relationship between authenticity and HIL is interesting to consider, because authenticity, with its emphasis on self-autonomy, may be particularly geared towards a primary control view of well-being (e.g., SWB and PWB) rather than a secondary control view (e.g., HIL). However, HIL has previously been shown to be related particularly highly to the environmental mastery and self-acceptance subcomponents of PWB (Garcia et al. 2014). Garcia et al. pointed out that individuals experiencing harmony with the environment can choose environments that make them feel at ease, which suggests that they are knowledgeable and accepting of their selves. This, in turn, suggests a more authentic connection with the self.

Thus, we hypothesized the following: SOC and authenticity are positively related to grit. Furthermore, it is expected that gritty individuals pursue their goals for self-relevant reasons; in other words, their sustained persistence may be due to how much personal relevance and meaning they find in their goals and their connection to the self (i.e., their authenticity), which ultimately influences their well-being. Alternatively, someone who is high in grit but low in authenticity or SOC may demonstrate lower well-being, perhaps because they are pursuing goals that are not self-selected (or intrinsically motivated).

Grit has previously been shown to relate strongly to higher education levels and age (Duckworth et al. 2007), suggesting that grit may grow over time. However, there is no research regarding gender differences in grit. While there is no clear theoretical reason for why grit per se would be stronger for either gender, including gender as a variable would potentially reveal some important results.

4 The Present Study

The main aim of the study is to investigate the relationships between grit and various well-being types (SWL, HIL, and PWB) and whether these relationships are mediated by SOC and authenticity. Furthermore, we explored how sociodemographic variables (gender, age, and educational level) relate to grit, employing a moderated mediation analysis.

The hypotheses were investigated in two studies. Study 1 employed a university student sample, and, in order to replicate the results found in Study 1 and enhance their generalizability, we conducted Study 2 with a non-student sample.

5 Study 1

5.1 Method

5.1.1 Participants

Undergraduate and postgraduate students of Lund University were contacted via email asking them to participate in a study on well-being. Overall, 204 students responded; of these, 8 were excluded because they had not given consent ($n = 1$), left a significant

portion (40–100 %) of the items unanswered ($n = 3$), or had outlying data ($n = 4$ participants; see details below). Thus, the final sample size was 196 students (Mage = 26.4 years, $SD = 5.9$). One hundred twenty (61 %) were undergraduates and 75 (39 %) were postgraduates. One hundred seventeen (59.7 %) were women, 76 (38.8 %) were men, and three participants reported "other." One hundred forty participants were Swedish (71.4 %) and 12 (6.1 %) had a double nationality with Swedish; the rest were from other Nordic countries ($n = 10$, 5.1 %), other European countries ($n = 23$, 11.7 %), or from outside Europe ($n = 10$, 5.1 %). One participant did not report her/his nationality.

5.1.2 Procedure

The questionnaire was administered through an online university survey system, *Survey & Report*, which requires each participant to have a personalized password. The study purpose was explained to prospective participants in the invitation email along with information that their responses would be kept anonymous; at this time, they were asked to give consent. The survey could be accessed and completed in either English or Swedish. A small pilot study ($n = 5$) was conducted to confirm the functioning of the online system, scale comprehensibility, and necessary time for participation. Participation was estimated to take 15 min, and no difficulties or misunderstandings regarding the survey items were reported. One pilot participant filled out the survey in Swedish, reporting high comprehension.

5.2 Measures

5.2.1 Grit

We used the 12-item Grit Scale (Duckworth et al. 2007), which has two subscales: *perseverance of effort* (e.g., "I have overcome setbacks to conquer an important challenge") and *consistency of interest* (e.g., "I often set a goal but later choose to pursue a different one", reverse coded). Responses are made on a 5-point Likert scale ranging from 1 ("not like me at all") to 5 ("very much like me"). The scale has good internal consistency (Cronbach's alpha) ranging from 0.77 to 0.85 across six studies (Duckworth et al. 2007). In the present study (Study 1), the Cronbach's alpha for the whole scale was 0.83.

The Grit Scale was translated into Swedish using back translation (Sousa and Rojjanasrirat 2011). A native Swedish speaking PhD psychology student translated the scale into Swedish, after which three native Swedish speaking students fluent in English back-translated the Swedish version and compared the meaning between the English and Swedish versions. Furthermore, a native English speaker compared the original scale items with the back-translated English items to check for similarity in meaning. All those involved agreed that the scales were similar in meaning.

5.2.2 Sense of Coherence (SOC)

We used the 13-item SOC scale (Antonovsky 1987) to measure SOC. Permission to use this scale was obtained from the Executor of the Estate of Aaron Antonovsky. The SOC scale consists of three subscales: *comprehensibility* (e.g., "Do you have mixed-up feelings and ideas?"; reverse coded), *manageability* (e.g., "Do you have the feeling that you are being treated unfairly?"; reverse coded), and *meaning* (e.g., "Do you have the feeling that

you don't really care about what goes on around you?"; reverse coded). Each item is rated on a 7-point Likert-type scale. It has been widely used previously, and has high internal consistency (Cronbach's $\alpha = 0.74$–0.91; Antonovsky 1993a; for the Swedish sample, Cronbach's $\alpha = 0.86$, Lindmark et al. 2010). In the current study (Study 1), the whole scale had high internal consistency ($\alpha = 0.81$).

5.2.3 Authenticity

The 12-item Authenticity Scale was used in this study, developed by Wood et al. (2008). This scale has three subscales: *authentic living* (e.g., "I live in accordance with my values and beliefs"), *alienation from the self* (e.g., "I feel out of touch with the "real me"; reverse coded), and *accepting external influence* (e.g., "I always feel I need to do what others expect me to do"; reverse coded). Items are rated on a 7-point Likert-type scale from 1 ("not like me at all") to 7 ("very much like me"). Wood et al. (2008) reported Cronbach's α of 0.69 for *authentic living* and 0.78 for both *self-alienation* and *accepting external influence*. In the current study (Study 1), the Cronbach's α for the whole scale was 0.86.

The authenticity scale was subjected to the same back-translation process with the same people involved. The items were deemed to correspond between translations, except for one item ("I feel alienated from myself"), which was further discussed by two native Swedish speakers until a suitable Swedish sentence had been obtained ("Jag känner mig främmande för mig själv", back-translated to "I feel like a stranger to myself").

5.2.4 Psychological Well-Being (PWB)

Ryff and Keyes' (1995) 18-item Psychological Well-being scale was used to measure PWB; this scale contains six subscales: *autonomy* (e.g., "I have confidence in my opinions, even if they are contrary to the general consensus"), *environmental mastery* (e.g., "I am quite good at managing the many responsibilities of my daily life"), *personal growth* (e.g., "For me, life has been a continuous process of learning, changing, and growth"), *self-acceptance* (e.g., "I like most aspects of my personality"), *purpose in life* (e.g., "Some people wander aimlessly through life, but I am not one of them"), and *positive relationships* (e.g., "I have not experienced many warm and trusting relationships with others"; reverse coded). Responses are made on a 6-point Likert-type scale from 1 ("strongly disagree") to 6 ("strongly agree"). The Cronbach's α of the total PWB scale was 0.72 for the Swedish version (Kjell et al. 2015). The Cronbach's α of the whole scale in this study (Study 1) was also 0.85.

5.2.5 Satisfaction with Life (SWL)

We used the Satisfaction with Life Scale (Diener et al. 1985) to measure SWL. This scale comprises 5 items (e.g., "In most ways my life is close to my ideal") rated on a 7-point scale from 1 ("strongly disagree") to 7 ("strongly agree"). The Satisfaction With Life Scale has previously been reported to have good internal consistency ($\alpha = 0.85$; Pavot et al. 1991; for the Swedish sample, $\alpha = 0.88$; Hultell and Gustavsson 2008). In this study (Study 1), the Cronbach's α was 0.90.

5.2.6 Harmony in Life (HIL)

This was measured by the Harmony in Life Scale (Kjell et al. 2015), which is a 5-item scale (e.g., "My lifestyle allows me to be in harmony") rated with a 7-point scale (from "strongly disagree" to "strongly agree"). The Harmony in Life Scale has good internal consistency both previously (for the Swedish sample, Cronbach's $\alpha = 0.91$; Garcia et al. 2014) and currently, in Study 1 (Cronbach's $\alpha = 0.90$).

5.2.7 Statistical Procedures

Only the total score of each scale was analyzed; the subscales were not analyzed separately. Using SPSS 21, Pearson correlations and independent-sample t-tests were conducted to investigate the relationships between sociodemographic variables, grit, and the other variables of interest. Preliminary data checks were conducted to examine attrition and outliers, and to ensure that there were no violations of the assumptions of linearity, normality, and homogeneity of variances.

The dataset had some missing values, but no item exceeded 1 % missingness. The overall percentage of missing values was 4 %. A non-significant result using Little's MCAR test was found, χ^2 (2224) = 2169.51, $p = 0.79$, indicating that the missing values were missing completely at random (MCAR); therefore, the missing values were replaced using the expectation–maximization (EM) procedure (Tabachnick and Fidell 2007).

Inspection of histograms showed no clear deviations from normality. All scales showed some negative skewness, as is common to well-being scales (−0.34 for HIL, −0.43 for SWL, −0.5 for PWB, and −0.41 for authenticity). The skewness, however, was clearly below a commonly used cut-point-range, that is, between −1 and 1 (Hair et al. 1998), and the trend of skewness was to the same direction (slightly negative) for all variables; therefore, no transformations were performed.

Mediation models were examined using the SPSS macro command set PROCESS (Hayes 2014) to evaluate significance of direct and indirect effects. Bootstrapping was used to estimate the indirect effects, as this procedure makes no assumptions about the sampling distribution of direct or indirect effects. Instead, bootstrapping approximates the sampling distribution empirically, with no recourse to mathematical derivations; bootstrapping has been shown to be superior to other methods of estimating indirect effects, both in terms of power and Type I error rate (Preacher and Hayes 2008). In all models, background variables (e.g., age and educational level) that were found to be significantly related with the study variables in the correlation analyses were included as control variables.

Mediation was tested with the framework suggested by Zhao et al. (2010). They proposed the following types of mediation: (1) complementary (similar to "partial mediation" by Baron and Kenny 1986), wherein both the indirect and direct effects are significant and pointing to the same direction; (2) competitive, wherein indirect and direct effects are significant but point in opposite directions; and (3) indirect-only (similar to "full mediation" in Baron and Kenny 1986), wherein there is a significant indirect effect and a nonsignificant direct effect. We used the framework by Zhao et al. (2010) instead of the more widely used Baron and Kenny (1986) framework because the former allows for a more nuanced mediation analysis, particularly given the inclusion of competitive mediation, which might be important in this study, considering the possible undermining effect of grit on well-being (i.e., the rigidity).

A heterogeneity test (Altman and Bland 2003; Fairchild and MacKinnon 2009) examining the significance of the gender differences between indirect effects was used to evaluate whether gender moderated the tested indirect effects.

5.3 Results and Discussion

5.3.1 Preliminary and Correlational Analyses

No significant gender differences were found, indicating that both females and males reported similar levels of grit, SOC, authenticity, and well-being. Similarly, Pearson correlations between age and the various scales (ranged from −0.02 to 0.05) were not significant.

The correlational analyses were performed separately for women and men. Significant correlations ($p < 0.001$) were found among all variables (see Table 1). Most of the correlations were similar between genders, with the largest difference found between grit and HIL, which is almost twice as strong for men (r = 0.59) as for women ($r = 0.31$), $z = 2.94$, $p < 0.01$. HIL was also more strongly correlated with SOC and PWB for men than for women (SOC: men, $r = 0.72$, women, $r = 0.58$; $z = 1.64$, $p = 0.10$; PWB: men, $r = 0.82$, women, $r = 0.68$, $z = 2.19$, $p = 0.03$). Women showed a stronger correlation between authenticity and SWL ($r = 0.54$) than men did ($r = 0.34$), $z = 1.67$, $p = 0.09$; women also demonstrated a non-significantly stronger correlation between grit and authenticity (women: $r = 0.49$; men: $r = 0.36$, $z = 1.06$, *ns*).

5.3.2 Mediation Analyses

The hypothesized mediations via SOC and authenticity for the relationships between grit and PWB, SWL, and HIL were performed separately. Given the gender differences in the correlational analysis, the mediation analyses were performed with gender as a moderator. Table 2 shows a summary of the results.

5.3.3 Grit and PWB

As Table 2 shows, for both genders, the indirect effects of grit on PWB through SOC and authenticity were significant. Because the significant direct effect prior to mediation attenuated but was still significant after mediation and pointed in the same direction as the indirect effect, the mediation was considered complementary (Zhao et al. 2010) for both genders.

The heterogeneity test revealed that even though the indirect effect between grit and PWB via SOC was stronger for men than for women (*Bs* = 3.9, 2.5; *SE*s = 1.3, 0.9, respectively), while the indirect effect via authenticity was stronger for women than for men (*Bs* = 3.5, 2.3; *SE*s = 1.0, 1.0, respectively), the differences were not significant for the partial indirect effects, $z = 0.89$, *ns,* and $z = 0.85$, *ns*, or for the total indirect effect, $z = 0.09$, *ns*. Thus, no moderation by gender was found.

5.3.4 Grit and SWL

For both genders, the total indirect effects of grit on SWL were significant. However, while for women, significant indirect effects were found for both mediators, for men, the

Table 1 Summary of intercorrelations between all measures for women (n = 117) presented below the diagonal and for men (n = 76) presented above the diagonal

Variable	1.	2.	3.	4.	5.	6.
1. Grit	–	0.50	0.36	0.59	0.42	0.59
2. SOC	0.49	–	0.57	0.71	0.51	0.72
3. Authenticity	0.49	0.65	–	0.64	0.34	0.49
4. PWB	0.63	0.68	0.72	–	0.73	0.82
5. SWL	0.44	0.55	0.54	0.76	–	0.76
6. HILS	0.31	0.58	0.55	0.68	0.75	–

SOC sense of coherence, *PWB* psychological well-being, *SWL* satisfaction with life, *HILS* Harmony in Life Scale

All correlations are significant at $p < 0.001$

significant indirect effect was found only via SOC (see Table 2). For both genders, the significant direct effects before mediation became non-significant, indicating indirect-only mediation (Zhao et al. 2010).

Although similar trends as above were found in terms of a stronger indirect effect via SOC for men and a stronger indirect effect via authenticity for women (while for men the indirect effect was not significant) for the relationship between grit and SWL (see Table 2), the differences were not significant for the indirect effect via SOC, authenticity, and the total indirect effect, $z = 0.60$, *ns*, $z = 1.41$, *ns,* and $z = 0.41$, *ns,* respectively. Therefore, no significant moderation by gender was found.

5.3.5 Grit and Harmony in Life

Again, for both genders, the total indirect effects of grit on HIL were significant. However, while for women, significant indirect effects were found for both mediators, for men, the significant indirect effect was found only via SOC (see Table 2). For women, the highly significant direct effect prior to mediation became non-significant with the mediators added, while for men, the significant direct effect prior to mediation was lower but still significant after mediation via SOC, indicating indirect-only and complementary mediation for females and males, respectively.

Again, a stronger indirect effect via SOC was found for men and a stronger indirect effect via authenticity was found for women for the relationship between grit and HILS (see Table 2), but the differences were not significant for the indirect effect via SOC, authenticity, and the total indirect effect, $z = 1.12$, *ns*, $z = 1.53$, *ns,* and $z = 0.17$, *ns,* respectively. Therefore, no significant moderation by gender was found.

5.3.6 Testing Alternative Mediation Models

Given the cross-sectional nature of the data, it is feasible that other alternative models exist. To examine this possibility, we tested reverse mediation models for the relationships between PWB, SWL, and HILS as the antecedents and grit as the outcome variables via SOC and authenticity (see Table 3). We followed the same procedure as with the original proposed mediation models. Although the results supported the reverse mediation model to some degree, the indirect effects for both genders for the proposed original mediation

Table 2 Summary of mediation results for the original mediation models for women (n = 117) and men (n = 76) separately

	Direct effect w/o mediators B (SE)		Direct effect w/mediators B (SE)		Indirect effect B (boot SE) [Boot CI]	
	Women	Men	Women	Men	Women	Men
Grit—PWB, direct effect	11.6 (1.3)	12.0 (1.9)	5.5 (1.2)	5.8 (1.7)		
Indirect effect via SOC					2.5 (0.9) [1.1 to 4.6]	3.9 (1.3) [1.8 to 6.8]
Indirect effect via authenticity					3.5 (1.0) [1.8 to 5.7]	2.3 (1.0) [0.9 to 4.7]
Total indirect effect					6.0 (1.3) [3.8 to 8.8]	6.2 (1.7) [3.4 to 9.9]
Grit—SWL, direct effect	4.7 (0.9)	5.2 (1.3)	1.7 (0.9) ns	2.7 (1.4) ns		
Indirect effect via SOC					1.6 (0.6) [0.5 to 3.0]	2.3 (1.0) [0.7 to 4.6]
Indirect effect via authenticity					1.4 (0.6) [0.4 to 2.7]	0.2 (0.6) [−0.7 to 1.7]
Total indirect effect					3.0 (0.7) [1.8 to 4.6]	2.5 (1.0) [1.0 to 4.9]
Grit—HILS, direct effect	2.9 (0.8)	7.0 (1.1)	−0.4 (0.8) ns	3.5 (1.0)		
Indirect effect via SOC					1.8 (0.6) [0.8 to 3.1]	3.1 (1.0) [1.6 to 5.4]
Indirect effect via authenticity					1.5 (0.6) [0.5 to 2.7]	0.4 (0.4) [−0.4 to 1.4]
Total indirect effect					3.3 (0.6) [2.2 to 4.8]	3.5 (1.0) [1.9 to 5.9]

PWB psychological well-being, *SOC* sense of coherence, *SWL* satisfaction with life; *HILS* Harmony in Life Scale, *ns* non significant

All effects except those with ns are significant at $p < 0.01$

models were much stronger than for the reverse models, in which most of the effects were either non-significant or very close to zero. These results indicate stronger support for the direction of relationships suggested in the original model.

Taken together, the results indicated that grit is significantly positively related to the three studied aspects of well-being, as expected. Furthermore, these direct relationships were mediated by SOC and authenticity (only for women in the relationships between grit and SWL and HIL), thereby partially confirming our hypotheses. Despite different mediating effects between men and women, a heterogeneity test revealed no significant differences. Thus, gender was not considered a moderator.

Table 3 Summary of reverse mediation results for the alternative mediation models for women (n = 117) and men (n = 76) separately

	Direct effect w/o mediators B (SE)		Direct effect w/mediators B (SE)		Indirect effect B (Boot SE) [Boot CI]	
	Women	Men	Women	Men	Women	Men
PWB—Grit, direct effect	0.03 (0.01)	0.04 (0.00)	0.03 (0.01)	0.03 (0.01)		
Indirect effect via SOC					0.00 (0.00) [−0.00 to 0.01]	0.01 (0.00) [−0.00 to 0.02]
Indirect effect via authenticity					0.00 (0.00) [−0.00 to 0.01]	−0.00 (0.00) [−0.01 to 0.01]
Total indirect effect					0.01 (0.01) [−0.00 to 0.01]	0.00 (0.01) [−0.01 to 0.02]
SWL—Grit, direct effect	0.04 (0.01)	0.03 (0.01)	0.02 (0.01) ns	0.02 (0.01) ns		
Indirect effect via SOC					0.01 (0.00) [0.00 to 0.02]	0.01 (0.00) [0.00 to 0.03]
Indirect effect via authenticity					0.01 (0.01) [0.00 to 0.02]	0.00 (0.00) [−0.00 to 0.01]
Total indirect effect					0.02 (0.01) [0.01 to 0.03]	0.02 (0.01) [0.01 to 0.03]
HILS—Grit, direct effect	0.03 (0.01)	0.05 (0.01)	−0.00 (0.01) ns	0.04 (0.01)		
Indirect effect via SOC					0.02 (0.01) [0.01 to 0.03]	0.01 (0.01) [−0.01 to 0.03]
Indirect effect via authenticity					0.02 (0.01) [0.01 to 0.03]	0.00 (0.00) [−0.01 to 0.01]
Total indirect effect					0.04 (0.01) [0.03 to 0.05]	0.01 (0.01) [−0.01 to 0.03]

PWB psychological well-being, *SOC* sense of coherence, *SWL* satisfaction with life, *HILS* Harmony in Life Scale, *ns* non significant

All effects except those with ns are significant at $p < 0.01$

The complementary mediation of SOC and authenticity for the relation between grit and PWB supports our framework with the organismic valuing perspective that being gritty is related to high consistency of self (SOC) and connection with the self (authenticity), thereby ensuring higher levels of PWB. However, since the mediation was complementary rather than indirect-only, other potential mediators may be involved that were not accounted for in our model (Zhao et al. 2010).

In contrast, the relation between grit and SWL showed an indirect-only mediation when both mediators were included in the model only for women. For men, the indirect effect via authenticity was not significant, suggesting that only SOC can comprehensively explain the relationship between grit and SWL. This indicates that men experience more internal coherence and trust in outside resources in their gritty pursuit of goals, and this experience helps them to feel highly satisfied.

The relation between grit and HIL was significantly mediated by SOC and authenticity for women, while for men, again the indirect effect via authenticity was not significant. Furthermore, while women showed an indirect-only mediation with both mediators, men showed only complementary mediation via SOC. However, the results of the heterogeneity test precluded any definitive statements on moderation by gender. It is possible that the sample biased the results, given that they were all affiliated in some way with a single university in Sweden, and were relatively close in age. Thus, we thought it necessary to expand and diversify the sample to further examine these relations.

6 Study 2

To replicate the findings in Study 1 in a more diverse and larger sample, we performed Study 2 with a non-student sample. The same correlational and mediation analyses described in Study 1 were performed in Study 2, so they will only be briefly described in the following section.

6.1 Methods

6.1.1 Procedure

The procedure was similar to that in Study 1. Again, participants were approached by email to participate in an online survey on well-being. The purpose was explained to them, and they were asked to give consent. Participants were recruited through one of the following methods: (1) previous Lund University students who had entered work life were recruited through email, and (2) online searches were made to locate contact details for teachers and school staff from various schools throughout Sweden (including Malmö, Lund, Stockholm, Uppsala, and Göteborg), who were subsequently contacted via email.

6.1.2 Participants

Altogether, 402 participants responded, 6 of whom were dropped from further analysis due to not giving consent (2 participants), leaving 40–100 % of the questions unanswered (3 participants), or being outliers on multiple variables (1 participant). Thus, the final sample was 396 participants, with 256 women (64.6 %) and 134 men (33.8 %). One hundred ninety-eight participants (50 %) were teachers, 17 (4.3 %) worked in education (other than teaching), 35 (8.9 %) were from the healthcare sector, 9 (3 %) were researchers, 17

(4.3 %) were consultants, 110 (25.5 %) reported various other occupations (e.g., IT workers, managers, baristas), and 12 (2.8 %) were unemployed. The ages ranged between 20 and 68 years, with a mean age of 40.8 years ($SD = 12.4$). Most participants were Swedish ($n = 291$, 73.5 %) or had double nationality with Swedish ($n = 15$, 3.8 %). Twenty-seven participants (6.8 %) were from other Nordic countries (Norway, Denmark, Finland, and Iceland), 31 (7.8 %) were from various other European countries, 15 (3.8 %) were from the US, and 14 (3.6 %) reported other nationalities. Three participants did not report their nationality. The majority of the participants had some form of higher education, including a bachelor's degree ($n = 145$, 36.6 %), a master's degree ($n = 201$, 50.8 %), or a PhD ($n = 30$, 7.6 %); only 17 (4.3 %) had not graduated higher education.

6.1.3 Measures

The same measures were used as in Study 1. Again, for all measures, the total scores of the scales were used; no separate analyses by subscale were conducted. The internal consistencies for the scales are as follows: Grit Scale, $\alpha = 0.81$; SOC scale, $\alpha = 0.84$; Authenticity scale, $\alpha = 0.84$; PWB scale, $\alpha = 0.81$; and SWL and HIL scales (Kjell et al., 2015), $\alpha = 0.90$ each.

6.1.4 Statistical Procedures

The same statistical tests were used in this sample as in Study 1. Preliminary data checks were conducted to examine attrition and outliers and to ensure that there was no violation of the assumptions of linearity, normality, and homogeneity of variances. Internal attrition was low (except for the 3 participants mentioned above who left 40–100 % of the questions unanswered). As for the internal attrition regarding missing values in the data set, altogether 5.6 % of item values were missing. No item had more than 5 % of values missing (indeed, no item exceeded 1.5 % of missing values), and SPSS missing value analysis found no patterns in the data. Further inspection using multiple imputation pattern analysis also revealed no patterns, so we concluded that the data was missing at random (MAR). We again employed the EM procedure to fill in the missing data, as it is an appropriate method for use with MAR data (Tabachnick and Fidell 2007). Analyses were run on both the original data set and the data set with missing values filled in, and the results were not significantly different.

Inspection of boxplots revealed some univariate outliers (between 2 and 6 outliers per scale). According to Tabachnick and Fidell (2007), a good way to deal with outlying values is to change the extreme score to the lowest non-outlying score minus one. This was done to all outlying extreme scores in order to reduce their impact on the results. An inspection of histograms showed that the distributions of the studied variables looked close to normal with skewness not exceeding the ± 1 limit (Hair et al. 1998). Thus, the assumption of normality was met.

6.2 Results and Discussion

6.2.1 Preliminary and Correlational Analyses

Significant gender differences were found in grit scores, indicating that women reported significantly higher scores ($M = 3.64$, $SD = 0.57$) than men did ($M = 3.42$, $SD = 0.59$,

$t(388) = 3.59$, $p < 0.001$, $d = 0.38$). Similarly, women reported significantly higher scores on both SWL (women: $M = 5.07$, $SD = 1.22$; men: $M = 4.73$, $SD = 1.47$, $t(388) = 2.42$, $p < 0.05$, $d = 0.25$) and PWB (women: $M = 4.81$, $SD = 0.54$; men: $M = 4.64$, $SD = 0.65$; $t(388) = 2.84$, $p < 0.05$, $d = 0.28$). However, according to the effect sizes (Cohen's d), the gender differences in the well-being measures and grit were not large. No other gender differences were found.

Age was weakly to moderately related to SOC ($r = 0.35$, $p < 0.01$), grit ($r = 0.23$, $p < 0.01$), authenticity ($r = 0.19$, $p < 0.05$), PWB ($r = 0.16$, $p < 0.05$), SWL ($r = 0.18$, $p < 0.05$) and HIL ($r = 0.24$, $p < 0.01$). We also compared by education level: Since the vast majority of the sample had either undergraduate level (Bachelor's) or post-graduate level (master's or PhD) education, these two groups were compared. SOC scores significantly differed by education, with post-graduate level participants having higher mean scores ($M = 5.1$, $SD = 0.92$) than the undergraduate level participants did ($M = 4.9$, $SD = 0.89$, $t(374) = 2.13$, $p < 0.05$, $d = 0.22$). Similar results were also found for SWL (post-graduates: $M = 5.2$, $SD = 1.3$; undergraduates: $M = 4.8$, $SD = 1.3$, $t(374) = 2.52$, $p < 0.05$, $d = 0.31$) and HIL (post-graduates: $M = 5.3$, $SD = 1.1$; undergraduates: $M = 5.0$, $SD = 1.2$; $t(374) = 2.11$, $p < 0.05$, $d = 0.26$). However, the effect sizes for the differences by education were rather small. An analysis of covariance was performed to see if the differences by education would remain after controlling for age. The results indicated that the differences by educational level were not significant once age was controlled for. As such, these differences are likely due to the differences in age between the participants.

Given the significant gender differences and correlations between age and the main variables, gender was included as a moderator (as in Study 1) and age and educational level were controlled for in the mediation analysis. Pearson's correlations between all variables are presented separately for females and males in Table 4. The intercorrelations between SOC and authenticity and the three well-being variables are similar for both genders, while those between grit and the other variables of interest were somewhat lower for women. Grit and PWB showed the largest gender difference (women $r = 0.44$, men $r = 0.66$, $z = -2.98$, $p < 0.01$), followed by grit and SWL (women $r = 0.29$, men $r = 0.43$, $z = -1.50$, *ns*) (see Table 4 for details). Given these significant correlations, mediation analysis was deemed possible.

Table 4 Summary of intercorrelations between the variables for women (n = 256) reported below the diagonal and for men (n = 134) reported above the diagonal

Variable	1.	2.	3.	4.	5.	6.
1. Grit	–	0.55	0.51	0.66	0.43	0.48
2. SOC	0.43	–	0.50	0.65	0.55	0.64
3. Authenticity	0.41	0.52	–	0.66	0.44	0.51
4. PWB	0.44	0.59	0.65	–	0.65	0.70
5. SWL	0.29	0.56	0.50	0.65	–	0.78
6. HILS	0.38	0.60	0.52	0.67	0.77	–

SOC sense of coherence, *PWB* psychological well-being, *SWL* satisfaction with life, *HILS* Harmony in Life Scale

All correlations are significant at $p < 0.001$

6.2.2 Grit and PWB

As Table 5 shows, for both genders, the total and partial indirect effects of grit on PWB through SOC and authenticity were significant. For both genders, the direct effects before mediation attenuated after mediation but were still significant; furthermore, it was in the same direction as the indirect effect, indicating complementary mediation (Zhao et al. 2010).

The heterogeneity test revealed no significant gender differences in total ($z = 1.25$, $p = 0.22$) or partial indirect effects via authenticity ($z = 0.46$, *ns*) or SOC ($z = 1.17$, *ns*) for the relationship between grit and PWB. Thus, no moderation by gender was found.

6.2.3 Grit and SWL

As shown in Table 5, for both genders, significant indirect effects via SOC and authenticity for the relationship between grit and SWL were found. When both mediators were added, the significant direct effects prior to mediation became nonsignificant for both genders, indicating indirect-only mediation.

Table 5 Summary of mediation results for the original mediation models for women (n = 256) and men (n = 134) separately

	Direct effect w/o mediators B (SE)		Direct effect w/mediators B (SE)		Indirect effect B (Boot SE) [Boot CI]	
	Women	Men	Women	Men	Women	Men
Grit—PWB, direct effect	7.4 (1.0)	13.1 (1.3)	2.1 (0.8)	6.1 (1.4)		
Indirect effect via SOC					2.2 (0.5) [1.4–3.3]	3.4 (0.9) [1.9–5.4]
Indirect effect via authenticity					2.7 (0.6) [1.6–4.1]	3.2 (0.9) [1.7–5.3]
Total indirect effect					4.9 (0.8) [3.5–6.7]	6.7 (1.2) [4.5–9.2]
Grit—SWL, direct effect	3.1 (0.6)	5.3 (1.0)	−0.5 (0.6) ns	1.1 (1.1) ns		
Indirect effect via SOC					1.8 (0.4) [1.1–2.6]	2.7 (0.8) [1.4–4.4]
Indirect effect via authenticity					1.1 (0.3) [0.6–1.8]	1.5 (0.6) [0.4–2.8]
Total indirect effect					2.8 (0.5) [2.0–4.0]	4.2 (0.8) [2.7–6.0]
Grit—HILS, direct effect	3.8 (0.6)	5.3 (0.9)	0.5 (0.6) ns	0.8 (0.9) ns		
Indirect effect via SOC					1.6 (0.3) [1.0–2.4]	2.7 (0.7) [1.5–4.3]
Indirect effect via authenticity					0.9 (0.3) [0.4–1.7]	1.7 (0.5) [0.8–2.8]
Total indirect effect					2.5 (0.5) [1.7–3.5]	4.3 (0.8) [3.0–6.1]

PWB psychological well-being, *SOC* sense of coherence, *SWL* satisfaction with life, *HILS* Harmony in Life Scale, *ns* non significant

All effects except those with ns are significant at $p < 0.01$

Table 6 Summary of reverse mediation results for the alternative mediation models women (n = 256) and men (n = 134) separately

	Direct effect w/o mediators B (SE)		Direct effect w/mediators B (SE)		Indirect effect B (Boot SE) [Boot CI]	
	Women	Men	Women	Men	Women	Men
PWB—Grit, direct effect	0.03 (0.00)	0.03 (0.00)	0.01 (0.00)	0.02 (0.01)		
Indirect effect via SOC					0.01 (0.00) [0.00 to 0.01]	0.01 (0.00) [0.00 to 0.01]
Indirect effect via authenticity					0.00 (0.00) [−0.00 to 0.01]	0.00 (0.00) [−0.00 to 0.01]
Total indirect effect					0.01 (0.00) [0.00 to 0.01]	0.01 (0.00) [0.00 to 0.02]
SWL—Grit, direct effect	0.03 (0.01)	0.03 (0.01)	−0.00 (0.01) ns	0.01 (0.01) ns		
Indirect effect via SOC					0.02 (0.00) [0.01 to 0.02]	0.02 (0.00) [0.01 to 0.03]
Indirect effect via authenticity					0.01 (0.00) [0.00 to 0.02]	0.01 (0.00) [0.00 to 0.02]
Total indirect effect					0.03 (0.00) [0.02 to 0.04]	0.03 (0.01) [0.02 to 0.04]
HILS—Grit, direct effect	0.04 (0.01)	0.04 (0.01)	0.01 (0.01) ns	0.01 (0.01) ns		
Indirect effect via SOC					0.01 (0.00) [0.01 to 0.04]	0.02 (0.01) [0.01 to 0.03]
Indirect effect via authenticity					0.01 (0.00) [0.00 to 0.02]	0.01 (0.01) [0.01 to 0.02]
Total indirect effect					0.02 (0.01) [0.01 to 0.04]	0.03 (0.01) [0.02 to 0.05]

PWB psychological well-being, *SOC* sense of coherence, *SWL* satisfaction with life, *HILS* Harmony in Life Scale, *ns* non significant

All effects except those with ns are significant at $p < 0.01$

The heterogeneity test revealed no significant gender differences in the total ($z = 1.48$, *ns*) or partial indirect effects via authenticity ($z = 0.60$, *ns*) or SOC ($z = 1.00$, *ns*) for the relationship between grit and SWL. Thus, no moderation by gender was found.

6.2.4 Grit and HIL

As with the previous relationships, the indirect effects of grit on HIL through SOC and authenticity were significant (see Table 5). For both genders, the significant direct effects prior to mediation became nonsignificant after adding SOC and authenticity as mediators, indicating indirect-only mediation.

Although, for men, the total ($B = 4.3$, $SE = 0.8$) and partial indirect effects via SOC ($B = 2.7$, $SE = 0.7$) and authenticity ($B = 1.7$, $SE = 0.5$) were stronger than were those for women ($Bs = 2.5$, 1.6, 0.9; $SEs = 0.5$, 0.3, 0.3, respectively) in the relationship between grit and HIL, the differences were not statistically significant, $z = 1.90$, $z = 1.44$, and $z = 1.37$, respectively. Therefore, no significant moderation by gender was found.

6.3 Testing Alternative Mediation Models

Alternative models again were tested to examine reverse mediation models for the relationships between PWB, SWL, and HILS as the antecedents and grit as the outcome variables via SOC and authenticity (see Table 6). Although the results supported the reverse mediation model to some degree, again, for both genders, the indirect effects for the proposed original mediation models were much stronger than for the reverse mediation models, in which most of the effects were very close to 0. These results once again provided stronger support for the direction of relationships suggested in the original model.

In summary, the findings of Study 2 further supported our hypotheses that grit is positively related to different aspects of well-being, and these relationships are mediated by SOC and authenticity. In this study, the same types of mediation were found for both genders, the mediation was always in the same direction and the heterogeneity tests revealed that the differences were not significant. Importantly, the findings of Study 1 were mainly replicated in a larger and more diverse sample, although there were slight differences regarding the indirect effect via authenticity in the relationships between grit and SWL and grit and HILS for men (see Table 7). Thus, our findings bolster the validity of the proposed model.

Table 7 Summary of the types of mediation found in study 1 and study 2 for women and men separately

Relationships	Study 1. Students		Study 2. Non-students	
	Women	Men	Women	Men
Grit—PWB via SOC and authenticity	Complementary	Complementary	Complementary	Complementary
Grit—SWL via SOC and authenticity	Indirect-only	Indirect-only[#]	Indirect-only	Indirect-only
Grit—HILS via SOC and authenticity	Indirect-only	Complementary[#]	Indirect-only	Indirect-only

PWB psychological well-being, *SWL* satisfaction with life, *HILS* Harmony in Life Scale

[#] Indirect effect is significant only via SOC

7 General Discussion

The aims of the present study were to investigate whether grit is positively related to different aspects of well-being, and whether these relationships are mediated by SOC and authenticity. These hypotheses were based on organismic valuing theory (Rogers 1961, 1964), which suggests that people are motivated to pursue their highest potential while growing towards a stronger connection with the self (authenticity), higher well-being, and HIL. These hypotheses were thoroughly tested in two studies, with Study 1 comprising a student sample and Study 2 comprising a larger, more diverse, and older sample of working adults. The results of both studies supported our hypotheses (with a minor deviation, discussed below): First, grit was strongly related to all aspects of well-being, which was expected given our theoretical framework of considering grit as a motivation akin to the growth motivation posited by organismic valuing process theory (i.e., the growth towards one's full potential). Second, these relationships were significantly mediated by SOC and authenticity for women in both studies and men in Study 2; however, for men in Study 1, the relationship between grit and SWL and HIL was mediated only via SOC while the indirect relationship via authenticity was not significant. Specifically, the relationship between grit and PWB showed complementary mediation via both mediators, while the mediations were indirect-only between grit and SWL and between grit and HIL (except for men in Study 1). Finally, we found no moderation by gender.

It must be noted that we did not expect SOC and authenticity to fully mediate (indirect-only) the relations between grit and the three aspects of well-being. So while one could argue that complementary mediation indicates a weaker relationship between the variables, and that there are some factors unaccounted for by the model (see Zhao et al. 2010), one could also argue that the direct relationship between the variables (e.g., grit and PWB) was important, which we did expect in the model. This would then suggest the need for further exploration of the grit and well-being relationships.

The direct relationship between grit and PWB seems of particular importance to our model, given that the PWB construct represents the eudemonic aspect of well-being, with its focus on long-term endeavors such as personal growth and purpose in life, which may be closely linked to the concept of grit (i.e., motivation to pursue long-term goals). This finding supports those of Von Culin et al. (2014), who showed that grit particularly reflects motivations to seek engagement and meaning, which are likewise in line with the eudemonic perspective of well-being as well as PWB. Equally important were the mediation of SOC and authenticity in the relationship between grit and PWB, as these coincide with organismic valuing theory (Rogers 1961, 1964), in that the passionate pursuit of long-term goals (i.e., grit) can be seen as a growth process towards one's full potential and higher well-being by strengthening the connection to the self and the ability to reject external pressures.

Unlike the direct relationship between grit and PWB, that between grit and SWL became nonsignificant when both SOC and authenticity were added (i.e., indirect-only mediation), for women in both samples and for men in Study 2. This suggests that being gritty by itself is not enough to guarantee higher SWL, but that SOC and an authentic connection to the self are needed. This is an intriguing finding considering that pursuing goals might be an important source of SWL (Sheldon et al. 2010) so long as this pursuit is self-relevant and connected to one's true motives—that is, the pursuit must be meaningful in order for one to feel satisfied with it (see also Sheldon and Elliot 1999). Sheldon et al. (2010) similarly found that persistent engagement with goals that satisfied one's needs over a 6-month period enhanced well-being. Therefore, persisting in attempting to achieve goals

with high self-relevance might be particularly conducive to SWL. However, for men in Study 1, the mediation via authenticity was not significant, while the indirect-only mediation was found only via SOC.

Similar results regarding mediation were found for the relationship between grit and HIL (i.e. an indirect-only mediation), with the exception of the student male sample in Study 1 (which showed a significant complementary mediation as well as a nonsignificant mediation via authenticity). Therefore, both authenticity (except for male students) and SOC served as important and strong mediators between grit and HIL, suggesting that grit on its own does not guarantee high harmony. As discussed in the introduction concerning primary-control and secondary-control views of well-being (Kjell 2011), grit could be seen as being mainly related to a primary-control view, given that one actively attempts to control one's environment in pursuing goals (see Haase et al. 2012). However, grit was also found to be related to a secondary-control type of well-being, harmony, suggesting that grit is also reflective of an ability to find harmony with one's surroundings. However, the results suggest that they are related when the pursuits are highly self-directed—namely, when one can easily manage the resources involved in that pursuit and the pursuit is governed by a sense of comprehensibility and meaning (i.e., SOC), and the pursuit is highly relevant to one's authentic self. Therefore, as with SWL, being gritty does not guarantee enhancement of a sense of harmony with the world—rather, the pursuit must be self-relevant, or in Sheldon and Elliot (1999) terminology, self-concordant.

It is interesting to consider the reason why authenticity was not an important mediator between grit and SWL and grit and HIL for the younger men sample (Study 1). Perhaps for the younger men it is more important to feel a sense of support from one's resources (i.e. other people and the world, SOC) to be satisfied and feel harmony with one's gritty pursuit, whereas whether or not one feels highly authentic is not so important. However, it should be noted that for grit and PWB, authenticity was important—PWB is a long-term well-being resource (Wood and Joseph 2010) for which the ability to have a highly authentic self-connection with one's long-term pursuit is important, but with shorter-term well-being (satisfaction and harmony), this may not be as necessary. It should be noted, however, that such suggestions can only be speculations, especially since this finding was not replicated for the older men sample (in Study 2). Further investigation about this with male students would be merited.

Maddi et al. (2013) mentioned the concept of "existential courage" (p. 132), which refers to the ability to respond flexibly and courageously to life's challenges, as something that may be lacking in the current definition of grit. However, the present results suggest that grit in fact contains, at least to some degree, such courage, particularly given its relation to HIL. Specifically, the results give some support for the notion that gritty people can pursue their passions but still have a harmonious connection to the surrounding world—this suggests that while being strong-willed in pursuit of their own goals, they can simultaneously consider the importance of balance with others, which suggests a certain flexibility in answering life's challenges flexibly to maintain a sense of well-being. Similarly, Rogers (1961, 1964) emphasized in his organismic valuing theory that when an individual engages with their own growth (e.g., grit), they are actively moving away from rigidity and fixed patterns of thoughts and behavior. However, in order to further elaborate grit in relation to flexibility (without using harmony as a proxy), further studies should look into flexibility directly.

Another interesting aspect that the results may indicate is that grit might reflect a particularly strong connection with the self. Both SOC and authenticity are aspects of high self-knowledge and connection (see Antonovsky 1987; Wood et al. 2008), and this self-connection might serve as a sort of compass for a gritty individual in pursuing their goals.

Self-connection is a crucial aspect of the organismic valuing theory, which emphasizes that growth towards one's potential is a growth towards a higher connection with the authentic self (Rogers 1961, 1964). Thus, grit, rather than reflecting a rigid determination to pursue one's goals no matter the costs, might reflect a determination to pursue goals so long as those goals are consistent with one's inner values. Furthermore, true grit might rely on a consistency of self (i.e., a high consistency of pursuits and interests in connection with the true self), much like identity consistency, which has been shown to be particularly high in flourishing individuals (Daukantaitė and Soto Thompson 2014).

Given that grit is a future-oriented motivation, it might induce a sense of hope, which in turn might make individuals feel a sense of meaning in their lives (see also Kleiman et al. 2013). This hope and meaning may be based on the strong relation between SOC and grit: In both studies, a strong positive relationship between grit and SOC was found, both in the correlational and mediation analyses. Thus, it is possible that the aspects of SOC (comprehensibility, manageability, and meaning) are necessary for grit. Specifically, SOC may be necessary in order for gritty individuals to feel able to successfully pursue their goals in the long-term, because it would give them a sense of trust that the world is not chaotic, and holds resources that allow them to manage pursuit of their goals, and thereby attain higher well-being. This has some theoretical backing: Antonovsky (1993b) introduced the idea of a "chaos theory" of human life, which indicates that because human life is inevitably full of uncertainties, potential adversities, and fluctuations, it is important to have something within the self that remains stable and coherent in order to remain well. Grit reflects a perseverance for long- term goals, however, such goals can be far ahead in the future and life can have many unexpected turns until that time. In order to maintain well-being while adhering to their goals, gritty individuals cannot remain inflexible, disregarding what life brings in the meantime; rather, they must maintain a stable connection to the self and be able to orient themselves to the world, trusting in its resources and their own ability to manage those resources. Thus, it makes sense that the relations of grit with authenticity and SOC were particularly important for well-being. This view of life as a process comprising various fluctuations and changes and requiring the ability to grow along it is also inherent for the organismic valuing theory (Rogers 1961, 1964).

Although it was suggested in the introduction that someone with high grit and low authenticity might have lower well-being, this profile could not be investigated because of the scarcity of participants showing such a profile (three participants overall). This may mean that high grit does not often co-occur with low authenticity. However, it may be that the samples we studied were inordinately high in grit and well-being, so it would be interesting to study different profiles of grit and authenticity, such as whether someone who is highly gritty could have lower well-being because of a low sense of authenticity; this would mean that their pursuit of goals is not self-concordant.

8 Limitations

Both studies have some limitations. First, they were cross-sectional and therefore causal inferences cannot be made. Indeed, the mediating relationships reported in the present study do not indicate whether being gritty causes one to have higher SOC, authenticity, or well-being. Additionally, other variables not included in the study could contribute or wholly explain the studied relationships (see Hayes 2013; Zhao et al. 2010).

Furthermore, while running mediation analyses in a cross-sectional design, establishing a direction of the relationship in the mediation model can be problematic. Testing alternative

mediation models—as suggested by Hayes (2013)—may help to establish (albeit not with certainty) an argument against the competing order of the proposed relationships. In both studies, we tested the reverse mediation models, and the results provided some support for our proposed direction of the relationships. That is, both direct and indirect relationships via SOC and authenticity for the relationships between grit and the three aspects of well-being were much clearer and stronger in the proposed mediation models as compared to the reverse mediation models, in which all relationships were either non-significant or close to zero. However, in order to determine the causal relationships and causal order of the relationships with certainty, an experimental or longitudinal design should be employed.

Moreover, Maxwell and Cole (2007) and Maxwell et al. (2011) have demonstrated that mediation analysis of cross-sectional data may produce biased estimates of the effects of mediators, and therefore they recommended that mediation hypotheses be tested with longitudinal data. Thus, in order to further validate our results, employing a longitudinal design would be of great importance. A longitudinal design would also provide clearer support for the organismic valuing theory, because this would allow for greater clarity in how the growth process takes place and the specific causal factors involved in this process. In other words, the concept of growth in the present study relates more to a theoretical growth (as captured in the relationships of certain traits) rather than an actual maturational process.

Secondly, only self-reported data were collected. It is possible that people might not have necessary self-knowledge about concepts such as well-being and grit to be able to answer the measures accurately. Moreover, social desirability may have influenced how participants responded. Although Wood et al. (2008) showed that answers on the authenticity scale did not reflect social desirability, it would be important to ensure the same for all the scales used. Nevertheless, social desirability bias was partially controlled by emphasizing in the instructions for each scale to answer as honestly as possible and that there are no right or wrong answers.

Because we approached participants by email, the reasons for non-response are not clear (e.g., failure of email delivery, email was not checked). The sample, therefore, was self-selected, consisting of people who were particularly interested in answering a survey on well-being; it may be that only those who had experienced high well-being chose to participate. Another shortcoming in the sampling procedure was that the participants were reached by the university email system, or through schools, indicating that the participants were a highly educated population. This reduces the generalizability of the findings to a less educated population. Previously, it has been shown that grit is higher among high achievers, such as university students (Duckworth et al. 2007) and teachers (Duckworth et al. 2009). Thus, different results might be found in other populations. Possibly, said populations would contain more low-grit profiles, which help would illustrate how low grit is related to well-being. Therefore, a different sampling technique would be required to find a more heterogeneous sample in terms of educational level, in order to further examine the relationships between grit, well-being, SOC, and authenticity.

9 Conclusions and Future Directions

Grit was found to be significantly and strongly related to PWB, SWL, and HIL, and these relationships were mediated by SOC and authenticity (except male students). The results from the two studies add to the research on positive psychology, providing new knowledge on the complexity of the relationships between variables–variables that had previously

been discussed separately. Furthermore, by using organismic valuing theory as a framework, our results offer further support for the humanistic psychology perspective on well-being as a growth process toward the fulfillment of one's potential and finding authenticity.

Further research on the relation of grit with well-being should examine the nature of goal pursuits in detail: specifically, would an intrinsic goal orientation be related to higher well-being, and would those gritty individuals who pursue extrinsic, self-disconcordant goals have lower well-being (see Sheldon and Houser-Marko 2001)? Although high authenticity could be indicative of authentic behavior and self-concordant goal pursuits, the actual nature of goals was not directly investigated in this study. This question would merit more focus and could further illustrate the conditions under which grit relates to higher well-being.

The consideration of dispositions that might be relevant for growth over time is another unanswered area within the research. Further studies could shed light on whether authenticity grows over the lifetime, and whether a gritty motivation truly causes enhancements in authenticity and SOC. Similarly, given the high interrelations between the concepts in our model, how can one promote the healthy growth of grit, SOC, and authenticity? Grit is a motivational aspect that could be enhanced in students via appropriate interventions (see Tough 2013), as has been done with gratitude (Seligman et al. 2005, 2009). In fact, grit seems to be involved in some new approaches to learning and teaching at schools, such as emphasizing perseverance of effort instead of noting levels of talent between children (see Tough 2013).

Both SOC and authenticity seem likely to develop over time. SOC is a dynamic construct that develops early in life and can continue developing throughout adulthood (Feldt et al. 2011). Authenticity, in contrast, can be affected by the social relationships in which one is involved (Robinson 2009; Robinson et al. 2012, 2014), and most likely grows as one's self-concept becomes more consistent with maturity. Furthermore, authenticity could be enhanced via discovery of one's own values and goals, which may be a worthy future research area. In general, given the highly positive connection between grit and well-being, a promising future step would be to consider interventions designed to improve grit and help people to become in touch with their own organismic valuing process, perhaps by making sure important resources (for a strong SOC) and self- relevance (authenticity) are considered.

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