

WELL-BEING IN MIDDLE TO LATE ADOLESCENCE: THE ROLE OF GRIT AND
LIFE EVENTS

by

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A Dissertation
Submitted to the
Graduate Faculty
of
George Mason University
in Partial Fulfillment of
The Requirements for the Degree
of
Doctor of Philosophy
Psychology

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Date: _____ Spring Semester 2016
George Mason University
Fairfax, VA

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Master of Arts
George Mason University, 2013

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ACKNOWLEDGEMENTS

I would like to thank the many friends, relatives, and supporters who have made this happen. I could not have accomplished this without the unwavering support of my advisor, Jerome Short, or without Todd Kashdan, whose honest criticism and guidance pushed this project to reach its full potential. I also thank Tara Chaplin for her time and effort in providing instrumental feedback. David Disabato and Daniel Blalock assisted with the data analysis and provided ongoing moral support, for which I am eternally grateful.

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ABSTRACT

WELL-BEING IN MIDDLE TO LATE ADOLESCENCE: THE ROLE OF GRIT AND LIFE EVENTS

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We used a strengths-based, dynamic person-environment fit approach to study adolescent well-being by considering the contribution of both environmental (life events) and person-level (grit) factors to predict changes in adolescent well-being over a period of one year. A sample of 306 adolescents, ages 15 to 18, from 18 countries completed online surveys. Using latent growth curve modeling, we found that both positive and negative life events predicted the rate of change in adolescent satisfaction with life (SWL), but not meaning in life (MIL), over a period of one year. Grit was positively related to initial levels of adolescent well-being. Grit-perseverance was negatively related to MIL growth over one year, and grit interacted with negative life events when predicting change in adolescent MIL. Results indicate that the dynamic factors of life events and grit influence trajectories of adolescent well-being, highlight a boundary condition for the beneficial

effects of grit, and provide new insights into the processes that influence positive youth development.

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INTRODUCTION

Adolescence is a period of immense change. Relationships with peers and family members evolve, new educational and occupational demands and responsibilities are introduced, and adolescents are faced with the challenging developmental task of establishing a sense of identity (Erikson, 1968). Importantly, psychological health and functioning during the teenage years can play a major role in influencing trajectories into adulthood (Lewinsohn, Rohde, Seeley, Klein & Gotlib, 2003). Given the importance of this developmental period, what do teenagers need to thrive? What characteristics help adolescents successfully navigate this potentially challenging time in life?

Research aiming to identify qualities that promote success for youth has recently focused on the relatively new construct of grit, defined as passion and perseverance toward long-term goals (Duckworth, Peterson, Matthews, & Kelly, 2007). Although research on the benefits of grit has largely focused on academic achievement, there is increasing interest in understanding how grit relates to other positive indicators of adjustment. This is consistent with movements in psychology that emphasize strengths-based approaches to the study of psychological health and functioning (e.g., positive psychology (Seligman & Csikszentmihalyi, 2000) and positive youth development (Lerner, Almerigi, Theokas, & Lerner, 2005)). Moreover, the majority of grit research

has been conducted with samples from western, educated, industrialized, rich, and democratic societies, signifying the need for more representative research across cultures.

The current study considers how grit might influence markers of positive psychological adjustment in a multi-national sample of adolescents. While there is a wide range of indicators of adolescent well-being, we focus on two constructs with substantial and growing research support: meaning in life (MIL) and satisfaction with life (SWL), which capture both eudaimonic and hedonic elements of well-being. Both MIL and SWL are indicators of well-being across the lifespan (Battista & Almond, 1973; Diener, 2009; Park, 2004; Scannell, Allen, & Burton, 2002; Steger, Oishi, & Kashdan, 2009), and there is growing interest in understanding the factors that enhance or detract from these markers of positive mental health. The current study aims to explore the synergistic effects of personal resources and environmental factors on these indicators of adolescent well-being. We examine the relationships among the personality strength of grit (a personal resource), positive and negative life events (environmental factors), and adolescent MIL and SWL (well-being), to better understand processes in positive youth development.

Theories of well-being: Why focus on meaning and satisfaction with life?

Theories of well-being have long distinguished between eudaimonia and hedonism, a distinction that harkens back to Aristotle's *Nicomachean ethics*. Eudaimonic well-being focuses on the pursuit of meaning and fulfillment, while hedonic well-being focuses instead on the search for pleasure (Ryan & Deci, 2001). Research on hedonic well-being often uses measures of subjective well-being (SWB; Diener, 1994), a

multidimensional construct that consists of satisfaction with life, the presence of positive affect, and the absence of negative affect. Research on eudaimonic well-being, on the other hand, includes a wide array of measures from varied conceptualizations of psychological well-being (PWB; Ryff & Singer, 1998), self-determination theory (Deci & Ryan, 2000), authentic happiness (Seligman, 2002), and meaning in life (Kashdan, Biswas-Diener, & King, 2008).

Some researchers draw a sharp divide between eudaimonia and hedonism (e.g., Ryan & Deci, 2001), but there is empirical evidence that these two types of well-being overlap considerably (Disabato, Goodman, Kashdan, Short, & Jarden, in press), and may operate in concert to produce optimal outcomes. The current research operates from the perspective that well-being should be studied “as a matrix or profile of various dimensions” (Kashdan et al., 2008; p.228) that captures both the eudaimonic and hedonic perspectives. Thus, we conceptualize well-being as involving both eudaimonic and hedonic elements, and consider the specific components of meaning in life (MIL) and satisfaction with life (SWL) as key indicators of adolescent well-being.

Meaning in life. The study of MIL is by no means a new endeavor; philosophers and writers have long questioned how people come to understand the meaning of their lives, but it has only recently become a serious scientific undertaking embraced by academic psychologists. The substantial and growing literature on MIL spans a range of theoretical perspectives, but definitions of MIL are moving toward a tripartite model that characterizes MIL as having three facets: coherence, purpose, and significance (Martela & Steger, 2016). Stated differently, MIL is “the extent to which people comprehend,

make sense of, or see significance in their lives, accompanied by the degree to which they perceive themselves to have a purpose, mission, or over-arching aim in life” (Steger, 2009, p.682).

Why might MIL be especially relevant to adolescence? Given the substantial developmental changes that occur during the teenage years, MIL may be an important asset for youth. Seeking a sense of coherence, purpose, and significance from life experiences might be one way that adolescents successfully navigate the substantial social, emotional, and cognitive changes associated with this developmental stage. Most researchers agree that the ability to construct meaning from life experiences emerges sometime in middle adolescence (Habermas & Bluck, 2000; Habermas & de Silveira, 2008; McAdams, 1985; McLean & Thorne, 2003) and may continue to increase into adulthood. In one three-year longitudinal study of Asian-American adolescents, Kiang and Witkow (2015) found that on average, presence of MIL increases over the course of the high school years, suggesting that it is during the middle to late adolescent years that youth begin the process of developing a sense of MIL.

Consistent with the adult MIL literature, there is growing evidence illustrating the psychological benefits of the presence of MIL in adolescence. MIL predicts both increased life satisfaction and decreased psychosocial problems among adolescents (Gillham et al., 2011; Ho, Cheung, & Cheung, 2010), and is linked with fewer negative emotions and depression, and higher self-esteem, positive emotions, and school motivation (Kiang & Witkow, 2015). Daily perceptions of meaning have been linked to daily emotional well-being in adolescents (Kiang, 2012) and youth who believe their

lives have meaning report higher levels of psychological well-being (Rathi & Rastogi, 2007), greater life satisfaction and self-esteem (Halama & Dedova, 2007), better health status (Nielsen & Hansson, 2007), and better overall psychological functioning (Steger, 2012). Youth who make sense of their lives and the world around them tend to fare better than their peers who do not, and the fact that this meaning-making process seems to emerge in adolescence and increase into adulthood provides compelling justification for exploring the factors that impact adolescent MIL.

Satisfaction with life. Similar to MIL, there is considerable evidence for the benefits of satisfaction with life (SWL) across the lifespan. SWL is a key component of subjective well-being (SWB), which is comprised of high levels of positive affect, low levels of negative affect, and life satisfaction (Diener, 1994). A number of studies have examined the correlates of SWB in adults, and concluded that individuals with higher levels of SWB tend to report higher self-esteem, better self-reported health, are more likely to get married, have more friends, perform better at work, and potentially even live longer (for reviews see Diener, 2009; Lucas & Diener, 2008). Moreover, individuals with lower levels of SWB are at risk for a number of psychosocial difficulties such as depression and poor social relationships (Lewinsohn, Redner, & Seeley, 1991). Regarding SWL in particular, past research illustrated that higher life satisfaction is linked with better health-related quality of life, fewer adverse health behaviors, lower levels of anxiety and depression, and better social support (Strine, Chapman, Balluz, Moriarty, & Mokdad, 2007).

Research on SWB in adolescence also demonstrates associations with numerous important outcomes such as better physical health (Frisch, 2000), less risky drug use and fewer problem behaviors (Zullig et al., 2001; Valois et al., 2001), and various indicators of psychological adjustment such as self-esteem, self-efficacy, mastery, and optimism (Park, 2004). As Park (2004) states, “SWB serves not only as a key indicator of positive development but also as a broad enabling factor that promotes and maintains optimal mental health” (p. 27). The specific SWB component of SWL may be an especially important well-being indicator; because SWL is based on overall judgments and appraisals of quality of life, it is more stable than the affective components of SWB and is a better indicator of overall well-being (Huebner, Suldo, & Gilman, 2006).

High levels of SWL in adolescence are associated with better psychosocial functioning (Suldo & Huebner, 2006), less externalizing behaviors in the context of stressful life events (Suldo & Huebner, 2004), and has been described as “an influential predictor of psychological states and psychosocial systems” in youth (Proctor, Linley, & Maltby, 2009, p.604). It is also worth noting that many studies find that SWL tends to decline during adolescence (Proctor et al., 2009), highlighting the necessity of exploring the factors that might influence changes in youth SWL during the adolescent years. Given the benefits associated with both the eudaimonic (MIL) and hedonic (SWL) components of well-being, it is essential to explore the individual and environmental factors that may influence whether and how adolescents experience MIL and SWL.

The role of life events

Life events may be an important environmental contributor to adolescent MIL and SWL. Although there is a substantial literature on life events, much of this research is focused on the relationship between life events and negative outcomes such as psychopathology or other indicators of dysfunction, with comparatively fewer examinations of how life events impact positive outcomes, particularly MIL. The literature on life events and SWL tends to focus on how people adapt to negative life events, with less attention to the impact of positive experiences. In spite of this imbalance, there is compelling theory and increasing empirical support that both positive and negative life experiences play an important role in whether or not adolescents feel a sense of meaning and satisfaction with their lives.

Life events and MIL. Although there is no consensus on how people achieve a sense of MIL, Baumeister's (1991) theory suggests that life circumstances play an important role. He proposed four essential motives that comprise MIL: purpose, value, efficacy, and self-worth. These four needs for meaning are extracted from interpretations of life experiences. The need for purpose is achieved when current events are connected to a larger, future-oriented framework; feelings of efficacy arise from events that are perceived as controllable; value is found when life events are seen as justified; and self-worth is accomplished through experiences that promote feelings of accomplishment (Sommer, Baumeister, & Stillman, 2013). In other words, a sense of MIL is cultivated from interpretations of life experiences.

Empirical evidence indicates that a variety of life events contribute to whether or not individuals perceive their lives to have meaning. Research on meaning-making

demonstrates that major life events, such as life threatening illnesses, can have a substantial impact on MIL (Park, 2010). There is also evidence that even minor life events contribute to MIL. For example, King and Hicks (2009) found that meaning arises in the context of both major and trivial life events, and other recent research demonstrated that daily positive and negative social and achievement events contribute to daily perceptions of MIL, above and beyond the contributions of daily positive and negative affect (Machell, Kashdan, Short, & Nezlek, 2015). Research on life events in adolescence shows that stressful life events contribute to perceived loss of control and a sense of meaninglessness (Newcomb & Harlow, 1986). The meaning-making and identity development process in middle to late adolescence involves making connections between the current self and past life events (McLean, Breen, & Fournier, 2010), suggesting that adolescents' life experiences may influence their perceptions of MIL.

Life events and SWL. The impact of life events on the components of SWB, including SWL, has been the topic of decades of research in psychology. Researchers are often conflicted as to whether life events really matter when it comes to SWB, with some arguing that life events have little to no lasting impacting on SWB (e.g., Hedy & Wearing, 1989, 1992; Diener, Lucas, & Scolon, 2006), and others contending that life events are an important and lasting contributor to SWB (e.g., Lucas, 2007). A recent meta-analysis concluded that major life events do have a longitudinal impact on all components of SWB, and advocated for examining the influence of life events on affect and SWL separately (Luhmannn, Hoffman, Eid, & Lucas, 2012). Indeed, there is a substantial adult literature demonstrating the contribution of both major and minor life

events to all components of SWB, including SWL (e.g., Lu, 1999; Gomez, Krings, Bangerter, & Grob, 2009). Positive life events appear to enhance SWB, while negative life events detract from it, and neutral events have little impact (Grob, 1991).

Among adolescents, there is evidence that life events contribute to SWB, which includes SWL, above and beyond global self-concept (McCullough, Huebner, & Laughlin, 2000), extraversion, and neuroticism (Suh & Diener, 1996). Both positive and negative life events predict adolescent SWB, with a stronger influence of negative events on the SWB of young people as compared to middle and older adults (Gomez et al., 2009). In adolescents, both chronic and acute stressors influence life satisfaction (Ash & Huebner, 2001), and there is evidence that both positive and negative environmental factors are associated with youth SWL (Proctor & Linley, 2014). Taken together, this research suggests that positive and negative life events are crucial to better understanding what influences the course of adolescent well-being.

An integrated approach to studying adolescent well-being

Recent models of well-being in both adults and youth highlight the importance of strengths-based approaches that consider the dynamic fit between a person and their environment. When summarizing three decades of research on well-being, Diener, Suh, Lucas, and Smith (1999) highlighted the importance of research that explores how personality variables influence an individual's reactions to environmental circumstances. Similarly, adolescent well-being researchers have called for the integration of personality and context when studying well-being (e.g. Ash & Huebner, 2001; McCullough, Huebner, & Laughlin, 2000). As Suh, Diener, and Fujita (1996) suggested, well-being

“is a product of both long-term personality and recent events” (p.1092). An exploration of life events and their contribution to MIL and SWL in adolescents requires consideration of individual differences that might influence these relationships. What personality traits promote adaptive responses to both positive and negative life events during adolescence?

The role of grit

Emerging research on the recently identified personality strength of grit suggests that it may be a key predictor of success and adjustment. Grit is defined as passion and perseverance toward long-term goals, and is characterized by stamina even in the face of adversity (Duckworth et al., 2007). Gritty individuals demonstrate consistent interest in a goal (passion), and are unwavering in their pursuit of this goal, even if setbacks occur (perseverance). The perseverance of effort dimension captures aspects of industriousness and work ethic, while the consistency of interest dimension refers to a consistent dedication to long-term goals. These two factors are highly related ($r_s \approx .55$; Duckworth & Quinn, 2009; Silvia, Eddington, Beaty, Nusbaum, & Kwapil, 2013) but may have differential effects depending on the outcome of interest. For example, consistency of interest is more strongly related to career changes among adults, while perseverance of effort is a better predictor of grade point average (GPA) among both high school (Duckworth & Quinn, 2009) and college students (Bowman, Hill, Denson, & Bronkema, 2015). Perseverance of effort has also been shown to better predict academic adjustment, sense of belonging, intent to persist in college (Bowman et al., 2015), and behavioral and emotional engagement in high school (e.g., Datu, Valdez, & King, 2016) than

consistency of interest. In general, however, both dimensions of grit have shown positive relations with indicators of achievement and success, and the authors of the scale recommend using an overall grit score as it demonstrated more predictive power than the individual subscales in the original scale development studies (Duckworth et al., 2007; Duckworth & Quinn, 2009).

Grit and life events. The benefits of grit may be particularly powerful in the context of adolescent life events. By definition, grit emerges under conditions of adversity—the strength of gritty individuals is that they persevere in spite of setbacks (Duckworth et al., 2007). These setbacks are likely to detract from both MIL and SWL. However, grit may be an individual resource that protects against these ill effects, with the grittiest adolescents failing to show dips in well-being even when they experience negative life events. Past research with adults demonstrated that grit buffered against the negative impact of negative life events on suicidal ideation (Blalock, Young, & Kleiman, 2015), suggesting that grit may be protective in the context of adverse experiences. Park's (2010) model of meaning-making emphasizes the role of global beliefs about the self, the world, and overarching goals in the process of adjustment and sense-making after negative life experiences. Grit might contribute to this process by inducing a sense of constancy, or “something within the self that remains stable and coherent” (Vainio & Daukantaitė, 2015, p.23). Gritty adolescents will be future-focused, which should provide an optimistic and hopeful orientation (Zimbardo & Boyd, 1999) that allows these youth to look beyond the immediate crisis posed by a negative life event, continue to focus on

their long-term goals, and subsequently be guarded against declines in MIL and SWL in the context of negative experiences.

There is little research on how grit might interact with positive life experiences to impact well-being. Because the strength of grit promotes the development of long-term, purposeful goals, gritty teens may be able to derive greater meaning and life satisfaction from positive events because they have a larger goal or framework to connect the experiences to. Grit might influence the process of “categorizing an encounter, and its various facets, with respect to its significance for well-being” (Lazarus & Folkman, 1984, p.31), also known as appraisal. Having consistent interests and a belief in one’s ability to persevere and achieve goals might help adolescents appraise positive life events in ways that maximize their potential benefits. To our knowledge, the present study is the first to explore how grit operates in the context of positive life events.

Grit and well-being. Although most research on the benefits of grit focuses on achievement, there is growing evidence to suggest that grit may also influence non-achievement outcomes. Grit has been linked with satisfaction with school and sense of school belonging (Bowman, Hill, Denson, & Bonkema, 2015), life satisfaction, harmony in life (Vainio & Daukantaite, 2015), happiness, and positive affect (Singh & Jha, 2008). Grit has been prospectively linked to greater psychological well-being (Salles, Cohen, & Mueller, 2014) and decreased suicidal ideation (Kleiman, Adams, Kashdan, & Riskind, 2013) in adult samples, and adults who are oriented toward finding happiness through engagement and meaning tend to be grittier than those who focus on pleasure (Von Culin, Tsukayama, & Duckworth, 2014). Further, there is some evidence to suggest that the

beneficial effects of grit can be partially explained by increases in MIL (Kleiman et al., 2013). Although the empirical support for the link between grit and well-being is limited in comparison to the literature on grit and achievement, initial evidence suggests that it should be a predictor of positive outcomes outside the realm of achievement and thus may be an important individual resource with direct effects on well-being.

This potential relationship between grit and well-being may be particularly important for adolescents, who are in a developmental stage characterized by the processes of developing an individual identity and corresponding belief systems. According to the life story model of identity (McAdams, 1985, 1993, 1996), it is during adolescence that people begin to construct a self-story that integrates their life experiences into a unified, purposeful narrative. Grit may be a key individual resource that is beneficial for this process. Research on young adults has demonstrated that some of the positive effects of grit on well-being are explained by increased sense of coherence (Vainio & Daukantaite, 2015). Grit may be a defining characteristic of adolescents who have high levels of well-being and successfully cultivate meaning from their life experiences because grit may promote the development of a coherent life story through consistent commitment to long-term goal pursuits.

Motivational theories suggest that successful goal achievement is key to the development and maintenance of well-being (e.g., Diener, 1984; Emmons, 1986; Little, 1998), and making progress toward goals in valued domains is linked to increases in well-being (Cantor & Sanderson, 1999; Oishi, Diener, Suh, & Lucas, 1999), and higher satisfaction with life among adolescents (Proctor et al., 2009). Given the theoretical and

empirical associations between grit and goal pursuit, and the essential role of goal pursuit for cultivating a sense of MIL/SWL, it follows that grit may facilitate MIL/SWL. Indeed, recent research linked grit to adolescent flourishing, a multifaceted construct that includes perceptions of living a “purposeful and meaningful life” (Datu et al., 2016). It is thus possible that grit directly influences adolescent well-being in addition to the beneficial effects that grit might confer for adolescents in the context of positive and negative life events.

The current study aims to explore the relationships among positive and negative life events, grit, and adolescent well-being. We propose the following hypotheses:

Hypotheses.

Hypothesis 1: Positive life events will be associated with *increased* growth in well-being (MIL/SWL) over the 1-year study period, while negative life events will be associated with *decreased* growth in well-being (MIL/SWL) over the 1-year study period.

Hypothesis 2. Grit will moderate the relationship between life events and well-being (MIL/SWL). The presence of grit at baseline should enhance the relationship between positive life events and increased well-being at 1-year. The presence of grit at baseline should attenuate the relationship between negative life events and decreased well-being at 1-year.

Hypothesis 3. Grit will be positively associated with well-being (MIL/SWL), and will independently predict *increased* growth in well-being over the 1-year study period.

METHOD

Participants

This study used adolescent community participants aged 15-18 who completed the International WellBeing Study (IWBS; <http://www.wellbeingstudy.com/>), which was designed and conducted by a consortium of international scientists centered in New Zealand. The IWBS consisted of a total of five waves, with each time point occurring three months apart. As expected, there was attrition between time points, with 1000 adolescents completing the baseline assessment, 306 completing two waves, 179 completing three waves, 129 completing four waves, and 80 completing all five waves. Because the current study aimed to explore changes in well-being over time, which requires at least two assessment time points, the sample was restricted to adolescents who had a minimum of two time points ($n = 306$)¹. All of these 306 adolescents were included in analyses, with missing data at the later time points modeled using full information maximum likelihood estimation. Adolescents came from 18 different countries, with the greatest number coming from Slovenia ($n = 102$), Greece ($n = 37$), China ($n = 34$), New Zealand ($n = 25$), Hungary ($n = 27$), the Czech Republic ($n = 13$), Slovakia ($n = 12$), and Russia ($n = 10$). No other nationalities had more than 10

¹ Recommendations for testing LGM in SEM suggest a minimum of 3 time points for every participant, and at least 200 participants at every time point in order to ensure sufficient power (Byrne, 2010). All models were tested with the restricted sample of the 179 adolescents who had at least 3 time points, and results were equivalent (although model fit was worse). The small sample sizes and attrition between time points are a limitation of the current study and are addressed in greater detail in the discussion section.

participants. Participants were majority female ($n = 263$), with a mean age of 16.94 years ($SD = 1.00$, range 15-18).

Procedure

The IWBS was advertised through various newsletters, email lists, website postings, and display posters. Data was collected from March 2009 to March 2013, with the last intake occurring in March 2012. The assessment batteries were collected at five time points, each occurring three months apart, over the course of a year. Individuals interested in participating in the study entered their email address on the study website, which allowed them to receive an email when the assessment portals were opened on the 1st of the given assessment month. Informed consent was also completed online. If adolescents failed to complete the assessment in the first three weeks of the assessment month, they received a second email. Adolescents who did not complete the measures during the assessment month were not included in the study.

The assessment battery consisted of 208 questions and took on average 29 minutes to complete. Adolescents were informed that upon completion of the study they would be entered into a drawing for ten \$100 amazon.com vouchers and would also receive an email report describing the study and measures, as well as their scores in relation to other participants.

Measures

Grit. The 12-item Grit scale assesses perseverance in the face of difficulties, and passion in pursuing long-term goals (Duckworth et al., 2007). Example items include “Setbacks don’t discourage me” and “I often set a goal but later choose to pursue a

different one” (R). In the original scale development study, the scale demonstrated good internal consistency ($\alpha = .85$) and predictive validity (Duckworth et al., 2007). Construct validity is supported by associations between grit and various measures of achievement success, beyond the contributions of IQ and conscientiousness (both of which are strongly correlated with achievement) (Duckworth et al., 2007). There is also evidence to support predictive validity for the two individual grit subscales. Grit-perseverance is positively related to academic adjustment, and intent to persist in college (Bowman et al., 2015), while grit-consistency is negatively related to career changes (Duckworth & Quinn, 2009). Among adolescents, higher grit is associated with better academic engagement (Datu, Valdez, & King, 2015) and higher GPA (Duckworth & Quinn, 2009). In the current study, we were interested in grit’s prospective predictive power and thus only adolescents’ baseline grit scores were used. In the current sample, the total grit score demonstrated reasonably good internal consistency at baseline assessment ($\alpha = .77$), as did the two subscales when examined individually (perseverance of effort: $\alpha = .75$; consistency of interest: $\alpha = .82$).

Positive Life Events (PLE) over 1-year. Positive life events were measured with a 5-item checklist capturing a range of possible positive events (ex: “Your living conditions improved”). At each time point, adolescents recorded whether each event occurred and described how positive the event was, ranging from (0) “did not happen” to (4) “a lot.” Responses to the 5 items were summed to create a composite score of PLE at each time point. Importantly, the measure of life events captured events that occurred in the past three months. For example: at 3-months, adolescents were rating whether or not

these events occurred in the previous three-month period (the period between baseline and 3-months) and at 6-months, adolescents were rating whether or not these events occurred in the previous three-month period (the period between 3-months and 6-months). This timeframe is consistent with past research indicating that the effect of life events on well-being tends to be most salient for approximately three months after the event occurs (Suh et al., 1996). A composite score of total PLE experienced over the course of the entire 1-year study period was created by averaging the PLE scores from all time points except baseline (the baseline PLE score captured PLE that occurred before the study period began). Because the event variables were essentially behavioral recordings representing a range of different possible life experiences, we did not expect them to be internally consistent and so we did not compute reliabilities for these two variables.

Negative Life Events (NLE) over 1-year. Negative life events were measured with a 5-item checklist capturing a range of possible negative events (e.g., “You had a serious disagreement with another person”). At each time point, adolescents recorded whether each event occurred and described how negative the event was, ranging from (0) “did not happen” to (4) “a lot.” Preliminary data analysis revealed that one of the NLE items (“You experienced a significant financial loss or lost your job”) was inappropriate for use in an adolescent sample. The item presented a zero-inflated distribution at all time points, with very few adolescents endorsing this experience. Thus, this item was not included in analyses. Responses to the remaining four NLE items were summed to create a composite score of NLE at each time point. Similar to PLE, participants rated whether or

not these events occurred in the previous three months and a composite score was created to capture the total NLE experienced over the 1-year study period.

Meaning in Life (MIL). MIL was measured with a 10-item scale assessing both the presence of meaning (“I understand my life’s meaning”) and the search for meaning (“I am always looking to find my life’s purpose”). Research indicates that MLQ-Presence is reliably associated with SWB, while MLQ-Search is negatively related to SWB (Steger, Frazier, Oishi, & Kaler, 2006). Because we were only interested in the extent to which adolescents perceived their lives to *have* meaning, we focused herein on the MLQ Presence scale (MLQ-P), assessed by five items. The MLQ-P is positively related to other indicators of well-being, including life satisfaction, positive emotions, as well as other measures of meaning and religiosity (Steger et al., 2006), demonstrating evidence for construct validity. Other research has demonstrated that the MLQ-P can be reliably used in adolescent samples (α s ranged from .84 to .91), and provided evidence for construct validity as the MLQ-P was positively related to other indicators of adolescent well-being, including self-esteem, academic adjustment, and daily positivity (Kiang & Fuligni, 2010). In the current study, the MLQ-P demonstrated good internal consistency at each time point (α s = .89, .88, .89, .91, .93, respectively).

Satisfaction with Life (SWL). To assess SWL we used the five-item presence subscale from the Temporal Satisfaction with Life Scale (TSWLS; Pavot, Diener, & Suh, 1998). Adolescents responded on a 7-point Likert scale to items such as “I am satisfied with my current life.” Previous construct validation studies found support for positive relations between the presence subscale and other measures of life satisfaction, positive

affect (Pavot et al., 1998), and global subjective well-being (McIntosh, 2001). The presence subscale of the TSWLS has demonstrated adequate reliability in past research with adolescents ($\alpha = .88$; Garcia, Rosenberg, & Siddiqui, 2011), and adolescents with higher TSWLS scores also tend to be more hopeful (Thakre, 2010) and show less emotional and behavior problems (Suldo & Huebner, 2006). In the current study, the scale demonstrated good internal consistency at each time point (α s = .87, .91, .90, .92, .92, respectively).

Depression. The 20-item Center for Epidemiological Studies-Depression Scale (CES-D; Radloff, 1977) was used to assess symptoms of adolescent depression. The CES-D is a widely used measure of depression that has demonstrated adequate reliability and validity in past research (Radloff, 1977) and has been used successfully as a screening tool for depression symptoms among adolescents (Garrison, Addy, Jackson, McKeown, & Waller, 1991). In the current study, the CES-D demonstrated excellent reliability ($\alpha = .91$). In order to ensure that the observed relationships cannot be better explained by levels of depression symptomology (which can impact self-report measures), adolescents' baseline CES-D scores were included as a covariate in all analyses.

RESULTS

Descriptive statistics

Error! Reference source not found. displays the means, standard deviations, and alpha coefficients of all measures and Table 2 provides the bivariate associations among the two grit factors, positive and negative life events, MIL, SWL, and the baseline depression covariate. As expected, baseline grit-perseverance was positively associated with MIL and SWL at all time points. Baseline grit-consistency also demonstrated significant positive associations with MIL and SWL at all time points, with the exception of SWL at 9- and 12-months. PLE over the 1-year study period were significantly positively associated with MIL and SWL all time points, with the exception of SWL at 9- and 12-months. NLE over the 1-year study period were not significantly associated with MIL except at 12-months, when it demonstrated a positive relationship with MIL. NLE were significantly negatively related to SWL at all time points. Adolescent depression symptoms at baseline also demonstrated significant associations with all variables at all time points, providing further support for its inclusion as a covariate.

Data Analysis Overview

Structural equation modeling (SEM) in Amos 22 (Analysis of Moment Structures; Arbuckle, 2006) was used to perform all analyses. Analyses were conducted using the full information maximum likelihood (FIML) estimation method to take full advantage of the data at each time point. FIML estimation uses all available observed data to compute

likelihoods for the observed portion of each case's data, which are then accumulated to generate estimates for the missing data points. There is evidence to suggest that FIML is a reasonable approach to handle missing data when correlates of missingness, hereafter referred to as auxiliary variables, are included in the models. In the current sample, both gender and baseline hope scores were correlated with missingness ($r_s > .4$), and were thus included as auxiliary variables in all models to reduce bias introduced by missing data.

Multiply indicated latent variables were created for grit, meaning in life, satisfaction with life, and the depression covariate. Latent variables were created using two methods: 1) by including scale items as the observed variables (used for the measures of grit, meaning in life, and satisfaction with life), and 2) by creating parcels of items using the within-domain approach so that each parcel included items from one subscale of each measure (used for the measure of depression). Parceling procedures allow fewer parameters to be estimated by grouping items with similar content together (Little, Rhemtulla, Gibson, & Schoemann, 2013), which offers several psychometric advantages such as increased reliability and reduced error variance (Little et al., 2002) and is particularly useful for scales with a large number of items (such as the CES-D). Positive and negative life events were represented by the observed variables only.

Confirmatory factor analyses (CFAs) were conducted on manifest indicators to test the measurement model of each latent variable to ensure appropriate factor structure for the current study. Past research has demonstrated that the accepted factor structures of widely used measures can change when tested on non-U.S. or non-Western samples (e.g., Datu et al., 2015), highlighting the necessity of conducting CFAs on all primary

constructs on interest. That the current sample is comprised of adolescents, when prior validation studies for many of our constructs were conducted using adults, provides further justification for the necessity of careful attention to measurement models.

Due to the longitudinal nature of the current data and our interest in predicting change in well-being over time, the proposed models were analyzed with latent growth curve modeling (LGM). In LGM, repeated measures of the well-being outcomes (MIL/SWL) were treated as indicators of latent variables representing systematic inter-individual differences in change in these constructs over the course of the 1-year study period. LGM allows for the estimation of intercepts and linear slope factors, which reflect the trajectory of variables over time (Preacher, 2010). **Error! Reference source not found.** provides a visual depiction of the LGM. Once the measurement models were identified, structural paths were added into the model to examine the effects of life events and grit on initial levels of well-being, as well as rates of change in well-being over the course of the 1-year study period.

Model fit was determined by examining fit indices compared to normative cutoffs (e.g. CFI & TLI > .9, RMSEA < .08) (Byrne, 2010). To examine the interaction of life events and grit on our well-being outcomes, the moderator (baseline grit) was multiplied by the life event variables to create latent interaction terms using the orthogonalizing procedures outlined in Little, Card, Bovaird, Preacher, and Crandall (2007). This created product indicators (interaction terms) that are uncorrelated with the indicators of the main-effect constructs. These interaction terms were then entered into the model after the linear main effects were estimated. Throughout all data analysis, full information

maximum likelihood (FIML) estimation with the inclusion of auxiliary variables was used to handle missing data.

Part 1: Measurement models.

Grit. Two initial measurement models, both using scale items as the observed variables indicating the latent grit variables, were tested to determine which yielded the best fit. The first (model 1) was a hierarchical model with perseverance and consistency loading on the higher-order factor of grit. The second (model 2) was a two-factor structure with perseverance and consistency as correlated latent factors without the hierarchical structure, with both latent-factors standardized (i.e., variances were set equal to 1) and correlated. Fit indices indicated that model 1 did not fit the data well: $\chi^2(54) = 484.30$, $p < .001$; comparative fit index (CFI) = .59; Tucker–Lewis index (TLI) = .50; root mean square error of approximation (RMSEA) = .16 (90% CI [.15, .18]). Model 2 demonstrated improved model fit: $\chi^2(50) = 118.76$, $p < .001$; CFI = .93; TLI = .91; RMSEA = .07 (90% CI [.05, .08]). The correlated two-factor structure (model 2) demonstrated the best fit for the data, which is consistent with past research indicating that the widely accepted hierarchical structure of grit does not necessarily apply to non-Western samples (Datu et al., 2015). The correlation between the two grit factors was significant ($\beta = .22$, $p = .004$), but lower than in other reported studies conducted in primarily Western samples (e.g., Duckworth & Quinn, 2009).

MIL and SWL. Confirmatory factor analyses (CFAs) were performed to determine whether well-being (MIL and SWL) was better modeled as one or two factors. All models used scale items as the observed variables to indicate the latent well-being

variables. A one-factor model was first conducted in which all well-being indicators for both MIL and SWL were loaded onto the same overarching well-being factor. The second CFA was a correlated two-factor model in which the five MIL indicators were loaded onto one factor and the five SWL indicators were loaded onto a second, separate factor.

Model fit for the one-factor model was poor at all time points. At baseline: $\chi^2(35) = 642.86$, $p < .001$; CFI = .64; TLI = .54; RMSEA = .24 (90% CI [.22, .26]); at 3-months: $\chi^2(35) = 652.87$, $p < .001$; CFI = .67; TLI = .58; RMSEA = .24 (90% CI [.23, .26]); at 6-months: $\chi^2(35) = 419.59$, $p < .001$; CFI = .65; TLI = .45; RMSEA = .19 (90% CI [.17, .21]); at 9-months: $\chi^2(35) = 404.36$, $p < .001$; CFI = .59; TLI = .35; RMSEA = .19 (90% CI [.17, .20]); and at 1-year: $\chi^2(35) = 314.22$, $p < .001$; CFI = .53; TLI = .25; RMSEA = .16 (90% CI [.15, .18]). The second CFA tested how well a correlated two-factor model of well-being represented the data. Both latent-factors were standardized (i.e., variances were set equal to 1) and correlated. The two-factor model fit the data well at all points. At baseline: $\chi^2(34) = 79.34$, $p < .001$; CFI = .97; TLI = .97; RMSEA = .07 (90% CI [.05, .09]); at 3-months: $\chi^2(34) = 89.50$, $p < .001$; CFI = .97; TLI = .96; RMSEA = .07 (90% CI [.06, .09]); at 6-months: $\chi^2(34) = 59.79$, $p < .001$; CFI = .98; TLI = .96; RMSEA = .05 (90% CI [.03, .07]); at 9-months: $\chi^2(34) = 47.71$, $p < .001$; CFI = .99; TLI = .98; RMSEA = .04 (90% CI [.00, .06]); and at 1-year: $\chi^2(34) = 52.78$, $p < .001$; CFI = .97; TLI = .95; RMSEA = .04 (90% CI [.02, .06]). All subsequent analyses examined the well-being indicators (MIL and SWL) as separate latent factors.

Full measurement model. Once the factor structures of grit, MIL, and SWL were confirmed, a final CFA was performed with all variables included (baseline grit, positive and negative life events over the course of the 1-year study period, MIL at all time points MIL, and SWL at all time points). Individual scale items were used as the observed variables indicating latent constructs for grit, MIL, and SWL, while the life event variables were represented as observed variables. This full measurement model yielded a marginally good fit for the data: $\chi^2(11760) = 2981.22$, $p < .001$; CFI = .88; TLI = .86; RMSEA = .05 (90% CI [.04, .05]).

Growth curves. Because we were interested in examining the trajectory of change in adolescent well-being over time, growth curves were calculated for both MIL and SWL across the five time points occurring over the course of the 1-year study period. Each measurement time point represented a latent variable indicated by the individual scale items. These latent variables then indicated latent intercept and slope factors, which represent the latent trajectory of change over time in each well-being variable. More specifically, the latent intercept variable represents adolescents' initial levels of well-being and the latent slope variable represents adolescents' rate of change in well-being over time. The LGM for MIL indicated good fit for the data: $\chi^2(221) = 453.27$, $p < .001$; CFI = .95; TLI = .92; RMSEA = .06 (90% CI [.05, .06]), as did the LGM for SWL: $\chi^2(224) = 347.97$, $p < .001$; CFI = .97; TLI = .96; RMSEA = .04 (90% CI [.03, .05]). This suggests that LGM is appropriate for use with the current data.

The estimate for the slope of MIL was not significant ($\beta = .10$, $p = .27$), meaning that on average, adolescent MIL did not change over the course of the 1-year study

period. In contrast, the estimate for the slope of SWL was significant and positive ($\beta = .28, p = .005$), meaning that adolescent SWL increased, on average, over the course of the 1-year study period. The variance estimates for both the slope and intercept factors were statistically significant for MIL ($ps < .05$) and approached significance for SWL ($ps < .053$), indicating that there are inter-individual differences in adolescents' initial well-being scores at baseline and in their change in well-being over time. This evidence provides support for further investigation of additional predictors (e.g., life events and grit) that might serve to explain the variability related to these growth trajectories.

Part 2: Structural models.

Once we confirmed that the initial measurement models and the growth curves fit the data appropriately, separate structural models were run for each well-being outcome (one for MIL and one for SWL) to examine the relationships among life events, grit, and the well-being outcomes. Figure 2 depicts a simplified version of the structural model for the main effects of life events and grit on well-being. As a reminder, all analyses include adolescent depression scores at baseline as measured by the CES-D as a covariate to eliminate the possibility that observed relationships are due to the effect of depressive symptoms, which are known to affect self-reports.²

Predicting Adolescent MIL over the course of 1-year.

Main effects of life events and grit on MIL. The structural model for both grit factors and both positive and negative life events predicting MIL yielded relatively good fit for the data: $\chi^2(787) = 1460.80, p < .001$; comparative fit index (CFI) = .89; Tucker–

² All models reported were also examined to explore differences by age group (middle versus late adolescence). No differences in any of the models emerged when age was included in the model.

Lewis index (TLI) = .87; root mean square error of approximation (RMSEA) = .05 (90% CI [.05, .06]).

Positive life events (PLE) experienced during the 1-year study period were significantly associated with adolescents' initial levels of MIL at baseline ($\beta = .15$, $p = .02$), but not with the rate of change in MIL over the course of the year ($\beta = .21$, $p = .12$). NLE experienced during the 1-year study period were not significantly associated with adolescents' initial levels of MIL at baseline ($\beta = .12$, $p = .07$), or with the rate of change in MIL over the course of the year ($\beta = -.03$, $p = .84$).

Adolescents' baseline levels of grit-perseverance were significantly associated with adolescents' initial levels of MIL at baseline ($\beta = .37$, $p < .001$), and with the rate of change in MIL over the course of the year ($\beta = -.35$, $p = .03$). Adolescents' baseline levels of grit-consistency were significantly associated with adolescents' initial levels of MIL at baseline ($\beta = .15$, $p = .04$), but not with the rate of change in MIL over the course of the year ($\beta = .09$, $p = .58$).

The interaction between grit and life events to predict MIL. After examining the main effects of life events and grit on adolescent MIL, we then examined the potential interaction between grit and life events when predicting MIL. Latent interaction terms were created using the orthogonalizing procedures outlined in Little et al. (2007) to explore whether or not grit-perseverance and grit-consistency moderated the relationships between life events and MIL. We examined the interactions between the two grit factors (baseline grit-perseverance and baseline grit-consistency) and the two life event variables (PLE experienced during the 1-year study period and NLE experienced

during the 1-year study period), resulting in a total of four interaction terms. These interaction terms were then entered into the structural models. Separate models were examined for each grit factor and each life event variable to maximize power to detect interaction effects, and to prevent bias due to multicollinearity.³

The structural model for grit-perseverance, PLE, and their interaction predicting MIL yielded a good fit for the data: $\chi^2(753) = 1268.35$, $p < .001$; CFI = .91; TLI = .90; RMSEA = .05 (90% CI [.05, .05]), as did the structural model for grit-perseverance, NLE, and their interaction predicting MIL: $\chi^2(753) = 1306.67$, $p < .001$; CFI = .91; TLI = .89; RMSEA = .05 (90% CI [.04, .05]). The only significant interaction term that emerged was for grit-perseverance interacting with NLE to predict the rate of change in MIL over 1-year ($\beta = .31$, $p = .02$). Higher levels of grit-perseverance resulted in a strengthened relationship between NLE & change in MIL: at high levels of grit-perseverance, more NLE led to more change in MIL, while at low levels of grit-perseverance, more NLE led to less change in MIL. In other words, adolescents with higher levels of baseline grit-perseverance experienced a slower rate of MIL growth at low levels of NLE than at high levels of NLE. Conversely, adolescents with low levels of baseline grit-perseverance experienced a faster rate of MIL growth at low levels of NLE than at high levels of NLE. The largest rate of MIL change was for adolescents with low levels of grit-perseverance *and* low levels of NLE. Said differently, grit-perseverance

³ Models including both grit factors and both life event variables were also tested. Due to the number of parameters estimated and the small sample size, model fit was suboptimal (CFI and TFI < .80). However, the significant interaction effects between the grit factors and NLE were in the same direction as reported from the results of the separate models, and approached significance: grit-perseverance*NLE ($\beta = .23$, $p = .07$), grit-consistency*NLE ($\beta = .24$, $p = .06$).

does not appear to be beneficial for MIL growth in the context of low levels of NLE. This interaction effect is illustrated in Figure 3.

The structural model for grit-consistency, PLE, and their interaction predicting MIL yielded a good fit for the data: $\chi^2(753) = 1277.79$, $p < .001$; CFI = .91; TLI = .90; RMSEA = .05 (90% CI [.04, .05]), as did the structural model for grit-consistency, NLE, and their interaction predicting MIL: $\chi^2(753) = 1293.45$, $p < .001$; CFI = .91; TLI = .90; RMSEA = .05 (90% CI [.04, .05]). The only significant interaction term that emerged was for grit-consistency interacting with NLE to predict the rate of change in MIL over 1-year ($\beta = .32$, $p = .02$). Higher levels of grit-consistency resulted in a strengthened relationship between NLE & change in MIL, such that at high levels of grit-consistency, more NLE led to more change in MIL, and at low levels of grit-consistency, more NLE led to less change in MIL. In other words, adolescents with higher levels of baseline grit-consistency experienced a slower rate of MIL growth at low levels of NLE than at high levels of NLE. Conversely, adolescents with low levels of baseline grit-consistency experienced a faster rate of MIL growth at low levels of NLE than at high levels of NLE. The benefits of grit-consistency for MIL growth emerged only in the context of high NLE. This interaction effect is illustrated in Figure 4.

In the context of high NLE, grit appears to buffer the negative impact of NLE on the rate of MIL growth over time. If adolescents were higher in both grit factors at baseline, they were able to maintain more growth in MIL than adolescents who were lower in both grit factors at baseline, for who NLE decreased growth in MIL over the course of the 1-year study period. However, both grit-perseverance and grit-consistency

seemed to be less beneficial for MIL growth over time in the context of low levels of NLE. Grit appears to only be useful in more challenging environments.

Predicting Adolescent SWL over the course of 1-year.

Main effects of life events and grit on SWL. The structural model for both grit factors and both positive and negative life events predicting SWL yielded good fit for the data: $\chi^2(785) = 1291.73$, $p < .001$; comparative fit index (CFI) = .92; Tucker–Lewis index (TLI) = .90; root mean square error of approximation (RMSEA) = .05 (90% CI [.04, .05]).

Positive life events (PLE) experienced during the 1-year study period were significantly associated with adolescents' initial levels of SWL at baseline ($\beta = .14$, $p = .047$), and with the rate of change in SWL over the course of the year ($\beta = .69$, $p < .001$). Similarly, NLE experienced during the 1-year study period were significantly associated with adolescents' initial levels of SWL at baseline ($\beta = -.15$, $p = .045$), and with the rate of change in SWL over the course of the year ($\beta = -.34$, $p = .01$).

Adolescents' baseline levels of grit-perseverance were significantly associated with adolescents' initial levels of SWL at baseline ($\beta = .34$, $p < .001$), but not with the rate of change in SWL over the course of the year ($\beta = -.20$, $p = .21$). Adolescents' baseline levels of grit-consistency were not significantly associated with adolescents' initial levels of SWL at baseline ($\beta = -.07$, $p = .37$), or with the rate of change in SWL over the course of the year ($\beta = .02$, $p = .88$).

The interaction between grit and life events to predict SWL. After examining the independent associations between life events, grit, and SWL, we then

examined the potential interaction between grit and life events when predicting SWL using the same procedures employed for predicting MIL.

The structural model for grit-perseverance, PLE, and their interaction predicting SWL yielded a good fit for the data: $\chi^2(753) = 1109.04$, $p < .001$; CFI = .94; TLI = .93; RMSEA = .04 (90% CI [.03, .04]), as did the structural model for grit-perseverance, NLE, and their interaction predicting SWL: $\chi^2(753) = 1124.23$, $p < .001$; CFI = .94; TLI = .92; RMSEA = .04 (90% CI [.04, .04]). No significant interactions emerged between life events and grit-perseverance when predicting initial levels of SWL at baseline or the rate of change in SWL over the course of the 1-year study period.

The structural model for grit-consistency, PLE, and their interaction predicting SWL yielded a good fit for the data: $\chi^2(753) = 1571.23$, $p < .001$; CFI = .94; TLI = .92; RMSEA = .04 (90% CI [.04, .05]), as did the structural model for grit-consistency, NLE, and their interaction predicting SWL: $\chi^2(753) = 1100.57$, $p < .001$; CFI = .94; TLI = .93; RMSEA = .04 (90% CI [.03, .04]). No significant interactions emerged between life events and the grit-consistency when predicting initial levels of SWL at baseline or the rate of change in SWL over the course of the 1-year study period.

DISCUSSION

In this study, our aim was to take a strengths-based approach to the study of adolescent well-being by considering the dynamic fit between adolescents and their environments. Using data from an international sample of adolescents, we examined relationships among positive and negative life events (environmental factors), grit (personal resource), and two indicators of well-being: meaning in life (MIL) and satisfaction with life (SWL) to explore the contribution of both environmental factors and personal resources to changes in adolescent well-being over a period of one year. Our results indicated that both positive and negative life events predicted the rate of change in adolescent SWL, but not MIL, over a period of 1-year. Both grit factors were positively related to initial levels of adolescent well-being, grit-perseverance was negatively related to MIL growth over 1-year, and both grit factors interacted with negative life events when predicting change in adolescent MIL. We discuss each of these findings in turn.

Life events and well-being

Partial support was obtained for our hypotheses regarding the relationships between life events and changes in adolescent well-being. Positive and negative life events did not predict the rate of change in adolescent MIL over the 1-year study period as we expected them to, but did predict the rate of change in adolescent SWL over the 1-year period. This is consistent with past research demonstrating that positive and negative

life events influence adolescent life satisfaction (McCullough et al., 2000; Suh & Diener, 1996). Our results indicated that more positive events were associated with higher initial levels of SWL and predicted greater SWL growth over 1-year, and more negative events were associated with lower initial levels of SWL and predicted less SWL growth over 1-year. That SWL increased, on average, over the 1-year study period, contradicts the findings of many studies reporting that SWL tends to decline with the onset and progression of adolescence (Proctor et al., 2009). It is possible that this is a result of sampling, as participants in the current study consisted of adolescents who self-selected for a study of well-being. These adolescents may have greater well-being and be more likely to experience growth in well-being than adolescents who would not volunteer for such a study.

It is somewhat surprising that neither positive nor negative life events had an impact on rates of change in adolescent MIL, when previous studies in young adults have found links between life experiences, specifically social and achievement events, and MIL (e.g., Machell et al., 2015). One possible explanation for this finding is our use of a life events measure that was not explicitly designed for adolescents and did not necessarily capture events in domains that are meaningful for this age group. A significant relationship between life events and rate of change in MIL might have emerged had we used a more sensitive or idiographic measure of adolescent life experiences.

An alternative explanation for the lack of observed main effects of life events on MIL is that adolescents' MIL scores remained relatively stable over the course of the 1-

year study period, which meant that on average, there was very little change in MIL to predict. It may be that life events are more impactful on perceptions of MIL on a smaller scale, such as daily perceptions of MIL (as reported in Machell et al., 2015), which may be more likely to fluctuate than global MIL ratings over three month intervals. The observed MIL stability in the current study provides support for the notion that global ratings of MIL are generally stable over time, even during middle and late adolescence. Past research has reported that both meaning and satisfaction with life are moderately stable over the course of 1-year (Kashdan & Steger, 2007). That MIL was stable over the 1-year study period may also be an indicator of the high levels of well-being in the current sample, as some research has suggested that individuals who have greater MIL stability fare better than individuals who have more unstable MIL (Steger & Kashdan, 2013).

The interaction between grit and life events

Despite the small change in adolescent well-being on average, exploration of potential interaction effects between grit and life events yielded an interesting finding: both grit-perseverance and grit-consistency moderated the relationship between negative life events and the rate of change in MIL over 1-year. Adolescents with higher levels of grit at baseline experienced less MIL growth when they experienced low levels of NLE, and more MIL growth when they experienced high levels of NLE. Conversely, adolescents who had lower levels of grit at baseline experienced more MIL growth when they experienced low levels of NLE, and less MIL growth when they experienced high levels of NLE. That no significant interactions emerged between grit and positive life

events suggests that the effects of grit may be uniquely important in the context of negative life experiences.

That high levels of grit were associated with less MIL growth in the context of low levels of negative events suggests that there are situations where grit may not be beneficial. This is especially true for grit-perseverance, as adolescents with high levels of this trait had the lowest MIL growth if they experienced few NLE. The theoretical model of grit (Duckworth et al., 2007) emphasizes perseverance in spite of *setbacks*, and our results seem to suggest that without these setbacks, perseverance does not confer benefits for adolescent MIL. Why might grit-perseverance result in less MIL growth for adolescents who experience fewer adverse events? If grit-perseverance is a trait central to these adolescents' identities, a lack of opportunities to face challenges and actually exert persistence may lead them to be less likely to feel that their lives make sense or have a purpose. A prominent theory of well-being emphasizes the importance of achieving self-concordant goals; when people achieve goals that are congruent with their intrinsic values and behavior tendencies, they should experience more benefits to indicators of well-being (Sheldon & Elliot, 1999). In the case of adolescents who perceive themselves to be highly perseverant, a lack of negative events might deprive them of the opportunity to achieve self-concordant goals (e.g., overcoming a setback) and subsequently result in less MIL growth.

Grit-consistency also appeared to be less adaptive in the context of low levels of NLE, but did result in more MIL growth when more NLE occurred. Why might grit-consistency be important for protecting adolescent MIL in the context of difficult life

experiences? It may be that grit-consistency is an essential individual resource for meaning-making in response to NLE. Park's (2010) meaning-making model contends that when individuals experience a potentially stressing situation (such as a NLE), they appraise the meaning of that event in the context of their larger belief systems. If the appraised event meaning is found to be discrepant with their global beliefs about themselves or the world around them, the meaning-making process is activated as individuals attempt to reduce that discrepancy. The current study did not assess meaning-making directly, and thus our hypotheses about how grit relates to this process are speculative. However, it may be that grit-consistency influences the initial event appraisal such that NLE are not necessarily interpreted as negatively. If an adolescent feels they are able to stay committed to a goal they are passionate about, they may be less likely to interpret NLE as threatening to their overall belief systems. It is important to note that the NLE assessed did not necessarily occur in the same domains as adolescents' passions. Findings may have been different had the negative events occurred in the domain of their primary interest. Future research should explore this possibility with ideographic measures of life events.

Although no significant interactions emerged between either of the grit subscales and positive life experiences, researchers should not rule out the possibility that grit is important in the context of positive experiences. The lack of effects may be due to measurement limitations or unique qualities of the current sample. It is possible that grit may boost well-being benefits in response to positive life events only if those events are related to the long-term goals and passions that foster adolescents' grittiness.

Grit and well-being

Our study provides an important contribution to the limited body of research examining the relationship between grit and non-achievement outcomes. Our results indicated that both grit subscales had independent associations with adolescent well-being, with partial support for our hypotheses. Grit-perseverance was positively associated with initial levels of adolescent SWL, but did not predict the rate of change in SWL over the 1-year study period. We found that the direction of the association between grit-perseverance and MIL differed when examined cross-sectionally versus longitudinally. Grit-perseverance was positively related to adolescents' initial levels of MIL at baseline, but was associated with *less* MIL growth, on average, over the course of 1-year. Adolescents who initially rated themselves higher on their ability to persevere in the face of setbacks actually experienced less MIL growth, on average, when compared to adolescents who did not perceive themselves to be particularly perseverant. At face value, this might suggest that high levels of grit-perseverance are actually detrimental to this indicator of well-being. However, when we examined the interaction between grit-perseverance and NLE, we found that in the context of high NLE, higher grit-perseverance resulted in an *increased* rate of MIL growth than in the context of low NLE. Taken together, these results suggest that NLE has less of an impact on slowing the growth of MIL if adolescents are high on grit-perseverance. Said differently, the benefits of grit-perseverance on MIL only emerged in the context of NLE.

Grit-consistency was positively related to adolescents' initial levels of MIL at baseline, but did not predict the rate of change in MIL over the course of 1-year. Grit-consistency was not related to initial SWL levels or with the rate of change in SWL over

the course of 1-year. The lack of relationship between grit-consistency and SWL is consistent with other research in non-U.S. samples indicating a lack of relationship between this grit factor and SWL (Datu et al., 2015). Grit-consistency also appears to lack the prospective predictive power of grit-perseverance, which supports growing research suggesting the perseverance factor is the more potent grit predictor (Bowman et al., 2015; Datu et al., 2016). Despite the lack of longitudinal findings, it is worth exploring the cross-sectional association between grit-consistency and adolescent MIL. Perceptions of MIL reflect a sense of coherence, purpose, and significance (Martela & Steger, 2016). Similarly, grit-consistency reflects lasting commitment to a passionate pursuit (Duckworth et al., 2007). Adolescents who have a consistent goal they are passionate about seem to also be likely to believe that their lives make sense, have a purpose, and fit in with the world around them. Although previous studies have suggested that grit-consistency is not as useful for predicting important outcomes when compared with the predictive power of grit-perseverance, none of those studies examined MIL as an outcome. Grit-consistency may be important for indicators of well-being that tap into eudaimonic elements such as MIL, purpose, or flourishing.

The role of culture and measurement

The current study used an international sample of adolescents from 18 different countries around the world. Importantly, our aim was not to conduct cross-cultural comparisons of our variables and relationships of interest. Instead, we attempted to establish generalizability of average effects across a broad sample of participants.

Measurement models indicated that grit, MIL, and SWL could be reliably assessed in our international sample.

As the literature on grit and adolescents is in its infancy, few studies have examined the effects of grit in adolescent samples as a function of cultural context. Several empirical studies have assessed grit in Asian cultures using college-aged or adult samples. Kim (2015) used the 12-item Grit scale (Duckworth et al., 2007) to assess the effects of grit on achievement orientation in college students in Korea, China, and Japan and reported acceptable reliability. Datu and colleagues (2015) conducted a more thorough validation of the 8-item short Grit Scale (Grit-S; Duckwork & Quinn, 2009) in samples of high school and college students from the Philippines. These researchers found that in this collectivist context, grit was comprised of two distinct dimensions rather than a hierarchical construct, with only the perseverance of effort subscale loading on a higher-order grit factor. Our own results also support the value of examining the two grit subscales separately, as suggested in other research (e.g., Abuhassan & Bates, 2015; Bowman et al., 2015), as the two-factor model provided a better fit for the data than the hierarchical model.

That the widely accepted factor structures of both MIL and SWL held in the current sample is consistent with past cross-cultural research. There is evidence that the factor structure of the MLQ is similar across cultures, with support from studies using samples from Japan (Steger, Kawabata, Shimai, & Otake, 2008), Spain (Steger, Frazier, & Zacchanini, 2008), and Chile (Steger & Samman, 2012). Other measures of MIL also demonstrate similar relationships between meaning and positive outcomes in non-U.S.

samples (Brassai, Piko, & Steger, 2011; 2013). Similarly, there is substantial evidence supporting cross-cultural comparisons of SWB using standard measures. For example, Park and colleagues (2004) concluded that the factorial invariance of life satisfaction across differing cultures (Korean and U.S. samples) provided support for meaningful international comparisons of life satisfaction among children and adolescents. The current results further support the use of these well-being measures in non-U.S. samples.

Limitations

The current findings should be interpreted in light of several important limitations. Perhaps the most important limitations stem from the characteristics of the sample. First, attrition between time points resulted in small sample sizes for the later assessment occasions, which significantly reduced power and raises concerns about stability of the effects. It is possible that the well-being trajectories for our study sample differed from the trajectories of adolescents who did not complete the study. Further, our data did not meet the recommended sample size of 200 participants at every measurement occasion (Byrne, 2010), which may have contributed to suboptimal model fit and potentially resulted in unreliable estimates. Although FIML estimation was used to model the missing data, future research with larger sample sizes is essential to replicate the current findings and increase confidence in our estimates. Another important caveat to note is that the change in MIL over the 1-year period, on average, was not significantly different from zero. Although the interaction effects discussed above were significant and relatively precise, the magnitude of these effects is very small, signifying the need for caution when considering the implications of these findings.

Second, the sample is primarily female with insufficient power to compare results by gender, so results cannot necessarily be applied to adolescent males. Though there are no compelling theoretical reasons to suggest that the relationships would differ by gender, this is an important limitation to note and future research should seek to test these relationships on samples with more equivalent gender distributions. A similar limitation is posed by the fact that current study has an international sample but due to unequal distribution of participants by country, we were unable to conduct multi-group comparisons of measurement or structural models by country or world region. This did not allow for exploration of whether any of the observed effects changed as a function of the cultural context. It is possible that our findings might differ depending on the adolescent's country of residence, although recent research using an international sample of adults revealed similar factor structures for well-being across 7 geographical world regions (Disabato et al., in press).

Finally, some of the key measures were not explicitly designed for use with an adolescent sample. As noted above, the life events measure poses a particularly important limitation, as it does not necessarily capture the types of experiences most relevant to adolescents' lives. Given that researchers from a Western background designed the life events measure, it is also possible (and even likely) that the checklist did not capture important events or experiences typical in the other cultures that comprise the current sample. Future research using culturally sensitive, adolescent appropriate measures would increase confidence in the current findings.

Conclusions and future directions

We took a strengths-based approach to the study of adolescent well-being by considering the contributions of both environmental factors (life events) and a personal resource (grit) on changes in adolescent meaning and satisfaction with life over a period of one year. In spite of several limitations, the current study offers important contributions to the literature on adolescent well-being. In our international sample of adolescents, we found that positive and negative life events influenced changes in adolescent SWL, but not MIL, over the course of the 1-year study period, and that both MIL and SWL were relatively stable over time. Results revealed that grit is important for outcomes beyond academic achievement, and that the effects of grit on adolescent MIL depend on the circumstances of that adolescent's environment. Specifically, grit was less beneficial in the context of low levels of negative life events, suggesting that this particular personal resource may only be adaptive if adolescents have the opportunity to face challenges. A more nuanced understanding of whether and when grit is adaptive is essential given increasing public interest in promoting grit in our youth.

Future research could build upon the current study by exploring whether grit is a trait that is malleable or can be cultivated in response to intervention. Negative experiences seem to be particularly important for the emergence of the benefits of grit, and might even be an important factor in determining who develops grit and who does not, but this is an empirical question that remains to be tested. Given the increasing interest in grit as a positive psychological trait, research must investigate the antecedents of this construct to continue advancing our collective knowledge of how to best promote adolescent well-being. Interestingly, our findings revealed that adolescent well-being is

relatively stable over the course of a 1-year period. We do not yet know how or whether stability of well-being in adolescence influences outcomes in emerging adulthood or beyond. Future research should examine additional antecedents, correlates, and outcomes of stable versus unstable trajectories of well-being in adolescence.

Taken together, our findings offer new insights into trajectories of adolescent well-being and the environmental and individual factors that influence these patterns. We hope that others who are also invested in positive youth development can expand upon our work by using larger, more representative samples, and ideographic measures developed for adolescents. Researchers must continue to explore the boundary conditions of the qualities we consider adaptive to identify avenues for intervention that are sensitive to the dynamic fit between adolescents and their environments.

TABLES AND FIGURES

Table 1

Descriptive statistics

	Mean	SD	Possible Range	α
Baseline grit-perseverance	3.42	0.74	1-5	.75
Baseline grit-consistency	3.23	0.84	1-5	.82
PLE over 1-year	9.94	4.27	0-20	--
NLE over 1-year	6.51	3.22	0-16	--
Baseline MIL	4.72	1.41	1-7	.89
3-month MIL	4.72	1.38	1-7	.88
6-month MIL	4.80	1.40	1-7	.89
9-month MIL	4.87	1.36	1-7	.91
12-month MIL	4.87	1.50	1-7	.93
Baseline SWL	4.34	1.40	1-7	.87
3-month SWL	4.42	1.47	1-7	.91
6-month SWL	4.62	1.41	1-7	.90
9-month SWL	4.78	1.41	1-7	.92
12-month SWL	4.71	1.44	1-7	.92
Baseline Depression	16.92	11.30	0-57	.91

*PLE = positive life events, NLE = negative life events, MIL = meaning in life,
SWL = satisfaction with life

Table 2

Bivariate correlations among all variables

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Baseline grit-per	--													
2	Baseline grit-con	.21*	--												
3	PLE over 1-year	.12	-.01	--											
4	NLE over 1-year	-.03	-.18*	.21**	--										
5	Baseline MIL	.44**	.30**	.23**	.02	--									
6	3-month MIL	.34**	.25**	.22**	-.00	.83**	--								
7	6-month MIL	.36**	.28**	.31**	-.04	.83**	.88**	--							
8	9-month MIL	.30**	.19*	.27**	.01	.78**	.88**	.87**	--						
9	12-month MIL	.23*	.17^	.24*	.19^	.69**	.80**	.80**	.86**	--					
10	Baseline SWL	.35**	.18*	.14^	-.23**	.45**	.44**	.43**	.38**	.31**	--				
11	3-month SWL	.32**	.16*	.26**	-.23**	.39**	.49**	.44**	.40**	.37**	.79**	--			
12	6-month SWL	.28**	.14^	.37**	-.21*	.38**	.45**	.41**	.41**	.39**	.72**	.76**	--		
13	9-month SWL	.20^	.11	.33**	-.22*	.41**	.45**	.47**	.49**	.41**	.69**	.81**	.80**	--	
14	12-month SWL	.27*	.13	.34**	-.35**	.18^	.32**	.35**	.36**	.31**	.67**	.71**	.71**	.76**	--
15	Baseline Depression	-.24**	-.27**	-.13^	.30**	-.41**	-.37**	-.38**	-.35**	-.23**	-.55**	-.51**	-.45**	-.49**	-.40**

Note. grit-per = grit-perseverance, grit-con = grit-consistency, PLE = positive life events, NLE = negative life events, MIL = meaning in life, SWL = satisfaction with life, CES-D = Center for Epidemiological Studies-Depression Scale. ^p<.05, *p<.01, **p<.001.

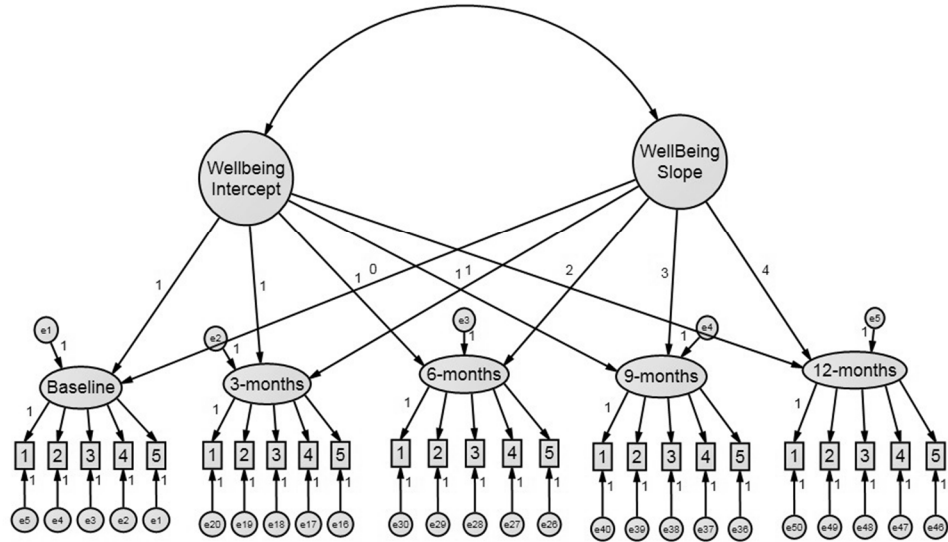


Figure 1. Simplified latent growth curve model.

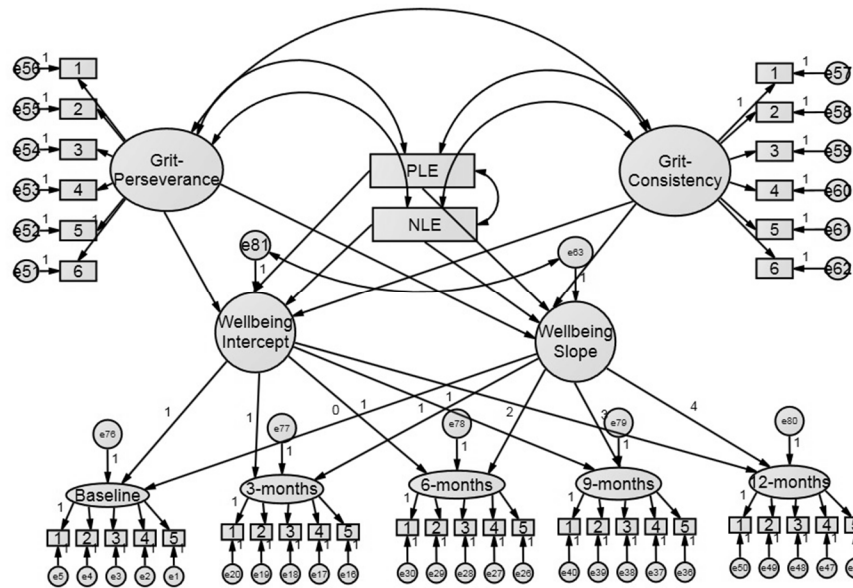


Figure 2. Simplified structural model for the main effects of life events and grit on well-being.

Note. All five latent well-being variables controlled for baseline CES-D (depression) scores, which is not pictured above for simplicity.

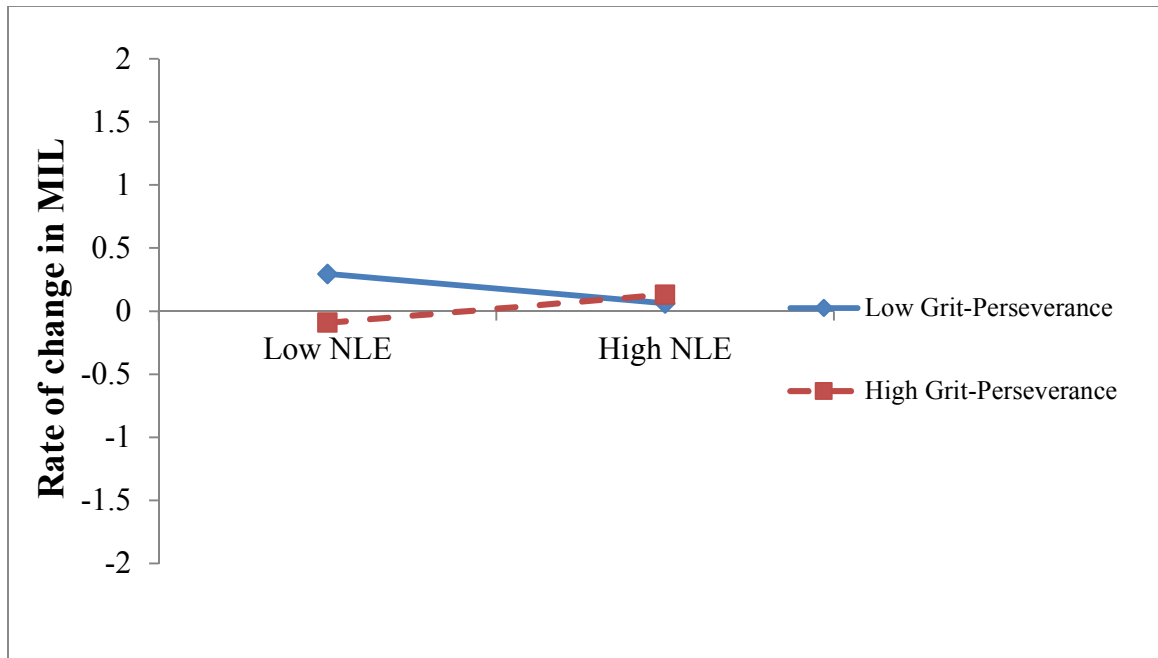


Figure 3. Interaction effect of NLE and grit-perseverance predicting rate of change in MIL.

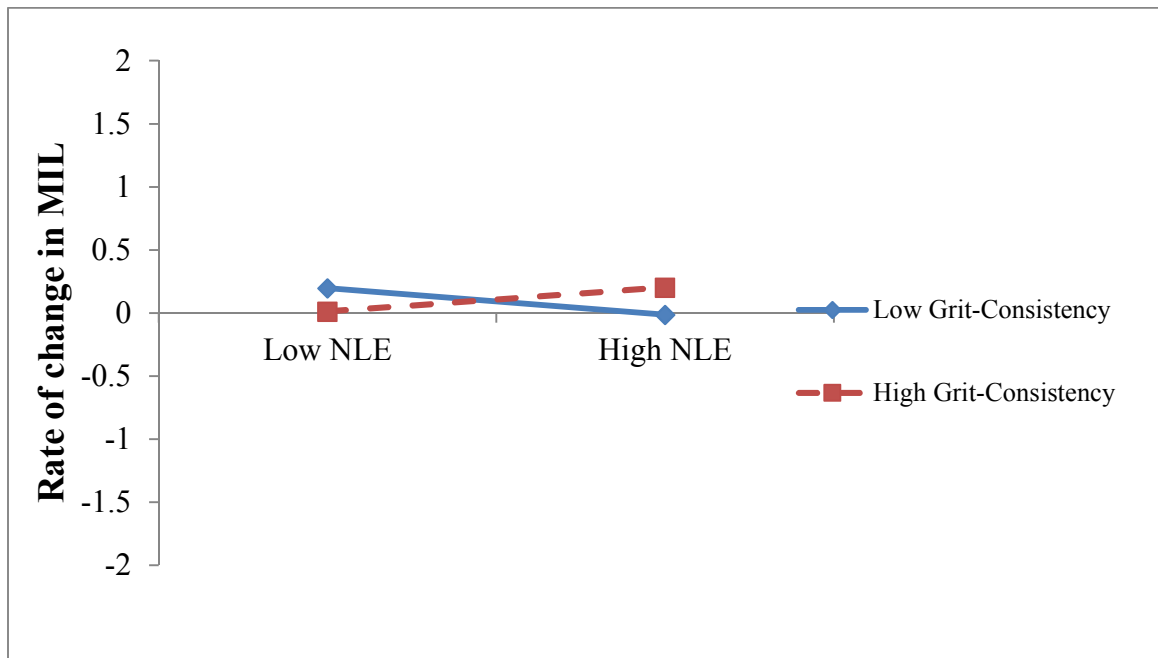


Figure 4. Interaction effect of NLE and grit-consistency predicting rate of change in MIL.

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