



저작자표시-비영리-변경금지 2.0 대한민국

이용자는 아래의 조건을 따르는 경우에 한하여 자유롭게

- 이 저작물을 복제, 배포, 전송, 전시, 공연 및 방송할 수 있습니다.

다음과 같은 조건을 따라야 합니다:



저작자표시. 귀하는 원저작자를 표시하여야 합니다.



비영리. 귀하는 이 저작물을 영리 목적으로 이용할 수 없습니다.



변경금지. 귀하는 이 저작물을 개작, 변형 또는 가공할 수 없습니다.

- 귀하는, 이 저작물의 재이용이나 배포의 경우, 이 저작물에 적용된 이용허락조건을 명확하게 나타내어야 합니다.
- 저작권자로부터 별도의 허가를 받으면 이러한 조건들은 적용되지 않습니다.

저작권법에 따른 이용자의 권리는 위의 내용에 의하여 영향을 받지 않습니다.

이것은 [이용허락규약\(Legal Code\)](#)을 이해하기 쉽게 요약한 것입니다.

[Disclaimer](#)

심리학석사 학위논문

Psychological Variables Related to
Grit Among Adolescents
in South Korea:
A Longitudinal Study
from Age 4 to 14

청소년기 그릿의 관련 요인 탐색:
만 4세부터 만 14세까지의 종단적 연구

2018년 2월

서울대학교 대학원
심리학과 발달심리학 전공
박 성 은

Abstract

Psychological Variables Related to Grit

Among Adolescents in South Korea:

A Longitudinal Study from Age 4 to 14

SongEun Park

Department of Psychology

The Graduate School

Seoul National University

Various studies examine the predictors of success, one of which is grit. Grit is defined as “perseverance and passion for long-term goals” (Duckworth, Peterson, Matthews, & Kelly, 2007, p. 1087). Although research on grit has been carried out over the past decade, studies on Eastern populations are still lacking compared with studies on Western. In addition, most studies have been conducted with college students. Moreover, most studies focus on the effects of grit, but there has yet to be a study on the precedent factors of

grit. Therefore, in the present study, Korean adolescents were examined, and the signs of grit were examined in longitudinal settings.

A total of 106 Korean adolescents participated in this study. In Study 1, the relationships between implicit theories of intelligence, academic achievement, and grit were explored. All variables were collected via self-reporting. The results showed that individuals' theories of intelligence and grit were related to academic achievement. In addition, the theory of intelligence was related to grit. Finally, grit fully mediated the relationship between the implicit belief of intelligence and academic achievements.

In Study 2, signs of adolescents' grit in adolescence were studied using 10-year longitudinal data. At age 4, parental education level, unrealistically optimistic beliefs, and the delay of gratification were measured. Parental education level was reported by the parents of the participants. Unrealistically optimistic beliefs were measured to investigate participants' overestimated cognitive bias regarding their ability or future. Both the positive change of negative traits and the maintenance of positive traits were measured, adopted from Choi and Kwak (2007). The ability to delay gratification was assessed using a waiting period originally developed by Mischel and Baker (1975), whereby children waited in front of their desired sweets to obtain bigger rewards in the future. In addition, grit was measured

by self-reporting when children turned 14 years old. Using stepwise regression analysis, we found that only the ability to delay gratification predicted grit in adolescence. While two factors of grit were analyzed independently, the delay of gratification only predicted perseverance of effort, not consistency of interest. In the present study, Korean adolescents' grit was extensively examined. The results suggest the possibility of early intervention in children with a low ability to delay gratification to prevent low grit in adolescence. Moreover, this is the first empirical study in which the signs of grit have been longitudinally investigated from a developmental psychological perspective. The implications and directions for future research are discussed.

Keywords: grit, delay of gratification, adolescence, early childhood, theory of intelligence, longitudinal study

Student Number: 2016-20190

TABLE OF CONTENTS

Introduction	1
The Present Study	7
Study 1.....	9
Grit and Academic Achievement.....	1 1
Theory of Intelligence and Academic Achievement.....	1 1
Grit and Theory of Intelligence	1 4
Research Questions and Hypotheses.....	1 6
Method	1 7
Participants	1 7
Procedures and Measures	1 8
Results	2 0
Descriptive statistics: Theory of Intelligence, Grit, and Academic Achievement	2 1
The Relationship between Theory of Intelligence, Grit, and Academic Achievement	2 2
Differences in Academic Achievement by the Theory of Intelligence and Grit.....	2 3

Effects of Implicit Theory of Intelligence and Grit on Academic Achievement.....	2 6
Grit as a Mediator in the Relationship between Theory of Intelligence and Academic Achievement.....	2 7
Discussion.....	3 1
Study 2.....	3 4
Parental Education Level and Grit.....	3 5
Unrealistically Optimistic Beliefs and Grit.....	3 7
Delay of Gratification and Grit	3 9
Research Questions and Hypotheses	4 2
Method	4 3
Participants	4 3
Procedures and Measures	4 4
Results	5 0
Descriptive Statistics: Parents’ Education Level, Delay of Gratification, Unrealistically Optimistic Beliefs, and Grit.....	5 0
The Relationship between Delay of gratification, Unrealistically Optimistic Beliefs, and Grit.....	5 3
Exploring Childhood Variables Predicting Adolescence Grit.....	5 5

Discussion.....	5 7
General Discussion.....	6 1
Reference.....	6 5
Appendix	8 4
국문초록	8 7

LIST OF TABLES

Table 1. <i>Descriptive Statistics of the Theory of Intelligence, Grit, and Academic Achievement</i>	2 2
Table 2. <i>Correlations Among Theory of Intelligence, Grit, and Academic Achievement</i>	2 2
Table 3. <i>Academic Achievement in Low and High Levels of Theory of Intelligence and Low and High Grit</i>	2 4
Table 4. <i>Multiple Regression Analysis of the Theory of Intelligence and Grit Predicting Academic Achievement</i>	2 6
Table 5. <i>Grit Mediating the Association between the Theory of Intelligence and Academic Achievement</i>	2 9
Table 6. <i>Sobel Test Statistics of the Mediating Role of Grit between the Theory of Intelligence and Academic Achievement</i>	3 0
Table 7. <i>Descriptive Statistics of Delay of Gratification, Unrealistically Optimistic Beliefs, and Grit</i>	5 2
Table 8. <i>Correlations between Unrealistically Optimistic Beliefs, Delay of Gratification, and Grit</i>	5 4

Table 9. <i>Stepwise Multiple Regression of Parental Education Level, Unrealistically Optimistic Beliefs, and Delay of Gratification in Relation to Grit</i>	5 6
Table 10. <i>Stepwise Multiple Regression of Parental Education Level, Unrealistically Optimistic Beliefs, and Delay of Gratification in Relation to Perseverance of Effort</i>	5 6

LIST OF FIGURES

Figure 1. <i>Participants' Theory of Intelligence, Grit, and Self-Reported Academic Achievement.</i>	2 5
Figure 2. <i>Mediation Model for the Theory of Intelligence, Academic Achievement, and Grit</i>	2 8

Introduction

Numerous researchers have sought to find reliable predictors of success through various research designs, and most focused on cognitive factors (Gottfredson, 1997). However, non-cognitive factors, such as self-control, conscientiousness, optimism, and grit, have also been extensively studied as predictors of success. One non-cognitive predictor of success is self-control ability. Specifically, individuals with a poor self-control reportedly tend to indulge in procrastination behavior, drug addiction, and social problems. Moreover, such individuals tend to demonstrate aggressive behaviors and develop anxiety and depression (Baumeister & Heatherton, 1996; De Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012; Eisenberg, Spinrad, & Eggum, 2010; Martel, Nigg, Wong, Fitzgerald, Jester, & Puttler, 2007; Moffit et al., 2011; Raaijmakers et al., 2008; Vohs & Faber, 2007). It is worth noting that self-control plays an important role both at a given point in time and throughout life.

Another important predictor of success is diligence. Specifically, diligent individuals tend to be more successful than others (Barrick, Mount, & Strauss, 1993; Egan, Daly, Delaney, Boyce, & Wood, 2016; Wagerman & Funder, 2016). In this regard, Wagerman and Funder (2016) showed that

academic grades in freshman and senior years in college are related to individuals' conscientiousness. Furthermore, according to a longitudinal study by Egan and colleagues (2016), a high level of conscientiousness in adolescence predicts low future unemployment. Third, optimistic people are reportedly more successful (Crane & Crane, 2007; Tetzner & Becker, 2017). Accordingly, the results of a meta-analysis of 25 years of research suggest that optimism is a common characteristic of successful business people (Crane & Crane, 2007).

Finally, grit is also reportedly effective for predicting individual success. The higher the grit, the more successful someone can be in various areas. For example, individuals with grit were found more likely to accomplish a high level of education (Duckworth, Peterson, Matthews, & Kelly, 2007). In addition, individuals with grit are more likely to complete the Army Special Operations Forces selection course, continue to work, complete high school courses, and maintain marital relationships (Eskreis-Winkler, Shulman, Beal, & Duckworth, 2014). According to Duckworth et al. (2007), compared to factors such as intelligence, self-control, and conscientiousness, grit is a stronger predictor of personal achievement.

Grit is defined as “perseverance and passion for long-term goals” (Duckworth, Peterson, Matthews, & Kelly, 2007, p. 1087). Many

psychological terms are similar to grit, including but not limited to conscientiousness, resilience, and self-control. Some psychologists mention the possibility of “jangle fallacy,” meaning that the concept of grit is no different from other psychological constructs: rather, the only aspect that differs is the definition (Crede, Tynan, & Harms, 2017). Agreeing with the contention that many psychological concepts share similar characteristics to grit, Duckworth emphasized that grit also encompasses the idea of “long-term stamina” (Eskreis-Winkler, Shulman, Beal, & Duckworth, 2014).

If so, what are the differences between self-control and grit? Some researchers have studied the differences between these two concepts. According to Duckworth and Gross (2014), there are subordinate goals and actions to achieve those goals and thus achieve the ultimate goal. Self-control is the ability to control conflicts between goals and actions in the process of achieving sub-goals. However, grit is the ability to achieve ultimate goals while establishing new subordinate goals as judged from the *status quo*. Duckworth and Eskreis-Winkler (2013) compared grit to a marathon. Even if there are moments in which an individual wants to give up, they continue trying to reach the finish line.

In recent years, the concept of grit and its definitions have been discussed by some researchers. According to Duckworth et al. (2007), grit

encompasses two components: “consistency of interest” and “perseverance of effort” (Duckworth et al., 2007). Consistency of interest refers to the longevity of pursuing goals and clarity of goals themselves. Furthermore, perseverance of effort implies the degree to which individuals are patient and how hard they work to achieve their goals (Duckworth et al., 2007).

Various grit studies have been conducted over the past decade. Available research has suggested that, among individuals of the same ability level, individuals with a higher grit tend to achieve more. For example, Duckworth and colleagues (2007) conducted a study of students entering the West Point US Military Academy. Admission to West Point is difficult and largely depends on Whole Candidate Score. The Whole Candidate Score is a combination of various abilities such as SAT scores and leadership abilities. Consequently, students who are accepted to West Point are highly qualified. However, around 5% of students quit school after the first summer of training at West Point. Therefore, the researchers focused on the features of the candidates associated with retention. According to their results, only candidates with grit successfully complete their first year of training at West Point.

Grit seems to be related to both students or candidates’ accomplishments and those of their teachers. According to Duckworth, Quinn, and Seligman

(2009), teacher effectiveness is related to grit. In this study, the optimistic explanatory style, grit, and life satisfaction of new teachers were measured at the start of the semester. Then, teacher effectiveness was measured by collecting students' improved grades at the semester's end. The results of the study reveal that teachers' grit is strongly associated with their efficiency.

Many studies have shown that grit is positively related to academic achievement (Duckworth et al., 2007; Lee & Sohn, 2013; Stayhorn, 2014). For instance, a study of Ivy League college students found that individuals with grit had a higher grade point average (GPA), even though they had attained low SAT scores (Duckworth et al., 2007). Likewise, Stayhorn (2014) reported that grit positively predicts GPA even when controlling for age, prior academic achievement, and other related factors (Stayhorn, 2014). The pattern of results outlined above also holds for the Korean population. Specifically, Lee and Sohn (2013) demonstrated that a higher grit score leads to a higher academic achievement while controlling for participants' intelligence and the big five personality traits, including conscientiousness.

Finally, previous research suggests that individuals with grit have positive psychological well-being and respond positively, even in negative situations (Blalock, Young, & Kleiman, 2015; Lee, Bae, Sohn, & Lee, 2016;

Salles, Cohen, & Mueller, 2014; Vaino et al., 2016). For example, in their study of the relationship between grit and the well-being of residents, Salles, Cohen, and Mueller (2014) found that individuals' grit predicts their future burnout and wellness. Moreover, Blalock, Young, and Kleiman (2015) proposed that grit works as a buffer between negative situations and suicidal ideation. Similar results were reported by Lee, Bae, Sohn, and Lee (2016). The emotional response to negative feedback was measured several times to determine whether emotional responses differed according to an individuals' grit. The results revealed that the emotional response did not differ immediately after receiving negative feedback, regardless of grit. However, when participants recalled the negative feedback, the negative emotional response differed.

These results suggest that, even though the same negative feedback was used, the response patterns differed depending on the grit. This means that people with more grit tend to respond more positively than those with less grit over time, even in the face of negative circumstances. These findings suggest that grit operates as a buffer for negative situations, leading to helping individuals' accomplishments. When combined, the findings above highlight that grit is strongly related to success and achievement.

The Present Study

Although several studies have been published on grit, these have certain limitations. First, participants in most studies were college students. According to Duckworth et al. (2007), the Grit Scale is a valid measure for measuring grit in adults, but it remains unclear whether this scale is also suitable for measuring grit in adolescents. Therefore, it is also necessary to examine grit in adolescents (Guerrero, Dubovitz, Chung, Dosanjh, & Wong, 2016).

Grit has many important implications, particularly for adolescents. First, according to Duckworth and Quinn (2009), grit positively predicts future academic achievements, but inversely predicts hours spent watching TV. In addition, since grit shapes adolescents' actions, goals, and identities (Damon, Menon, & Cotton Bronk, 2003), it reportedly helps young people focus on their future goals and prevents them from quitting school (Malin, Liauw, & Damon, 2017); therefore, students with long-term goals persevere when facing challenges.

Second, even though grit has been studied in South Korea over the past several years, research on Eastern populations is relatively scarce compared to the number of studies conducted in the West. Some recent studies have

emphasized the possibility of cultural differences in grit (Datu, 2017; Datu, Yuen, & Chen, 2016; Lim, 2017). Based on the limitations of previous research, grit should be studied in Korean adolescents. Therefore, we tried to explore the relationship between grit and related variables in a sample of Korean adolescents in Study 1.

Finally, empirical studies on grit very rarely assume a developmental perspective. Most studies view grit as an independent variable, focusing solely on its effects. This means that no longitudinal studies have examined grit's precedent factors in previous studies. In this context, examining the predictors of grit would help create elaborate early intervention strategies for individuals with low grit. The present study consists of Study 1 and Study 2. Study 1 examines the importance of grit and Study 2 focuses on exploring the variables that predict grit in adolescents.

Study 1

Individuals may define success differently. In fact, although there may be several indicators of achievement, one of the most important aspects of life for Korean adolescents is academic achievement. According to some empirical studies, the academic accomplishments of adolescents were related to life satisfaction and self-esteem (Crede, Wirthwein, McElvany, & Steinmayr, 2015; Kirkcaldy, Furnham, & Siefen, 2004; Lim & Park, 2006; Suldo, Riley, & Shaffer, 2006; Suldo, Shaffer, & Riley, 2008; Suldo, Thalji, & Ferron, 2011). This is predictable, as modern academic achievement is closely related to individuals' opportunities to gain employment or their future academic career (Crede, Wirthwein, McElvany, & Steinmayr, 2015; Rana & Mahmood, 2010).

According to statistics released by the Korean National Statistical Office, academic achievement is regarded as important starting in middle school (Baek, 2016). In addition, students described that they had a high level of stress and felt discriminated against based on their grades. Therefore, academic achievement might be an important index of triumph among Korean teenagers. Hence, the present study uses academic achievement as an indicator of success among Korean adolescents.

Grit and Academic Achievement

As mentioned earlier, previous research has demonstrated a positive relationship between grit and achievement. In their study of students at the University of Pennsylvania, Duckworth et al. (2007) found that students with grit had better academic outcomes compared to their peers without. In addition, grit was shown to be a better predictor of academic performance than intelligence. Duckworth and Quinn (2009) also measured grit in middle school students from various socioeconomic backgrounds. One year later, the authors measured grit again, while also collecting GPA and demographic data. The results showed that grit has a stable pattern across time and that initially measured grit could predict later GPA.

The psychological mechanisms between grit and academic achievement were examined by Duckworth, Kirby, Tsukayama, Berstein, and Ericsson (2011), who studied participants in the National Spelling Bee to see what mediated grit and triumph. Their results showed that deliberate practice mediated between grit and achievement. That is, participants with grit spent a lot more time in deliberate practice, which helped them get decent results in Spelling Bee competitions (Duckworth, Kirby, Tsukayama, Berstein, & Ericsson, 2011).

In South Korea, Lee and Sohn (2013) conducted a diary study on high

school students, the results of which showed that a higher level of grit led to higher grades. In addition, the relationship between these two variables was found to be moderated by deliberate practice. The pattern remained consistent, even when controlling for intelligence and the big five personality types. The results indicated that both innate abilities and acquired endurance and effort were important for academic achievement.

The results of recent research on grit and academic achievement have been inconsistent. Unlike previous studies, some have not shown any association between grit and success indicators (e. g., Bazelaïs, Lemay, & Doleck, 2016). Therefore, it is necessary to identify the relationship between grit and achievement with participants of various ages.

Theory of Intelligence and Academic Achievement

What are the factors that influence academic achievements? Based on common sense, it can be reasonably expected that high intelligence may lead to high academic achievement. However, some researchers argue that both intelligence and implicit beliefs are related to academic performance (Blackwell, Trzesniewski, & Dweck, 2007; Good, Aronson, & Inzlicht, 2003; Park, Gunderson, Tsukayama, Levine, & Beilock, 2016). In the implicit theory of intelligence, there is a belief about the variability of each

individual's intelligence (Dweck & Elliott, 1983; Schunk, Pintrich, & Meece, 2008). The implicit theory of intelligence is non-categorical; it stays on a continuum (Gelman, Heyman, & Legare, 2007; Gunderson, Hamdan, & Sorhagen, 2017; Thomas & Sarnecka, 2015). Specifically, people who assume the entity theory of intelligence believe that intelligence is fixed and not changeable (the fixed mindset). Meanwhile, those who adopt the incremental theory of intelligence believe that intelligence is malleable with individual effort (the growth mindset).

People with a growth mindset tend to try to improve their abilities and focus more on the goals of attaining mastery (Schunk, Pintrich, & Meece, 2008). Therefore, they tend to focus on boosting their abilities rather than comparing themselves with others. On the other hand, people with a fixed mindset tend to be more interested in how others evaluate them; therefore, they try to demonstrate their abilities. The theory of intelligence remains stable at 12–13 years of age (Schunk, Pintrich, & Meece, 2008). Therefore, it is essential to examine which theory of intelligence is adopted by middle school students and older student populations.

The perspective on intelligence forms individuals' responses, particularly in academic contexts. According to previous studies, theory of intelligence was found to be positively related to better academic grades

(Blackwell et al., 2007; Good et al., 2003; Park et al., 2016). For instance, Blackwell, Trzesniewski, and Dweck (2007) longitudinally examined the relevance of theory of intelligence and math grades in a sample of seventh grade students. The participants' math grades did not significantly differ when they first entered junior high school; however, the trajectory of their math grades over two years significantly differed depending on their mindset. Compared to participants who believed in the entity theory of intelligence, participants adopting an incremental theory of intelligence showed improved mathematical performance.

In a study by Good and colleagues (2003), college students mentored 7th grade students. In the experimental condition, participants were encouraged to adopt the view that intelligence is malleable via effort. The results showed that scores on a math standardized test and a reading standardized test were improved compared to the control group.

Grit and Theory of Intelligence

There has been considerable research into the relationship between grit and academic achievement and between the theory of intelligence and academic achievement. However, direct empirical research on the relationship between grit and implicit beliefs about intelligence in Korean adolescents is scarce. However, as suggested by a literature review outlined below, we can deduce the relationship between grit and implicit beliefs on intelligence. Some studies have investigated the correlation between these two variables (Duckworth & Eskreis-Winkler, 2015; West, Kraft, Finn, Martin, Duckworth, Gabrieli, & Gabrieli, 2016). For instance, West and colleagues (2016) suggested that the theory of intelligence and grit have a statistically significant correlation. Furthermore, in Duckworth and colleagues' unpublished data, there was a positive correlation between the growth mindset and grit (for reference, see Duckworth & Eskreis-Winkler, 2015). In other words, individuals with a growth mindset are more likely to have a high level of grit.

Another study identified the brain network of grit and the growth mindset via fMRI (Myers, Wang, Black, Bugescu, & Hoefft, 2016). In this study, both grit and the growth mindset were found to be related to the functional connectivity of the ventral striatal and bilateral prefrontal

networks, which were related to the control of cognition and behavior. However, there was also a difference between the brain networks of those two variables. While grit was related to the ventral striatal network, which is related to the delay of rewards and persistence, the growth mindset shows dorsal striatal and ventral striatal connectivity with the brain regions that monitor errors (Myers, Wang, Black, Bugescu, & Hoefft, 2016). This study showed that, while grit and the growth mindset have commonalities, they are not completely identical; therefore, we can predict the relationship between those two variables.

According to O'Rourke and colleagues (2014), participants who were encouraged to have an incremental theory of intelligence were more likely to continue playing educational games and showing persistence than those in the control group (O'Rourke, Haimovitz, Ballweber, Dweck, & Popovic, 2014). This was because people with the growth mindset attributed their failures to their own lack of effort and believed that they could learn from their failures. Therefore, they were generally not frustrated and could continue making efforts to achieve their aims (Blackwell et al., 2007; Henderson & Dweck, 1990; Rattan, Savani, Chugh, & Dweck, 2015).

Research Questions and Hypotheses

The present study's three research questions (RQ) are as follows:

- (1) Is grit among 14-year-olds related to academic achievement?
- (2) Is the theory of intelligence in 14-year-olds related to grit?
- (3) Does grit mediate the relationship between 14-year-olds' implicit beliefs in intelligence and their academic achievements?

With regard to the first and second research question, we anticipated positive correlations between grit and academic achievement and between an individual's theory of intelligence and academic achievement. Regarding the third research question, our hypothesis was that grit would completely mediate the relationship between implicit belief of intelligence and academic achievement. If individuals endorse the incremental theory of intelligence, thus believing that they can improve their abilities through personal efforts, they would value their work and try hard, which will naturally bring good performance. Meanwhile, if individuals endorse the entity theory of intelligence, they would not appreciate their efforts and thus invest less energy into trying, which will eventually lead to worse outcomes.

Method

Participants

Participants of the present study have joined the longitudinal study of Developmental Psychology lab at Seoul National University since 2002 when they were 1 month old. A trained research assistant in the laboratory called the perspective participants on the phone to explain the study's purpose and to ask whether they would be willing to participate. Regarding the participants, some were excluded for the following reasons: they were unable to come to the laboratory, were sick, and they did not answer the phone. The final sample consisted of 106 adolescents, of whom 56 were female. The mean age of participants at the time of the questionnaire's completion was 13.98 years old. Most participants resided in Seoul and the Gyeonggi province in the Republic of Korea.

The experimenter set the schedules with participants who were willing to participate. Participants were provided with detailed written descriptions and explanations about the aims of the study and the storage of the data when they arrived in the lab. Additional information was also provided if the participants had further questions. All participants agreed to participate in the study and signed informed consent forms. Before the study was

launched, all procedures and materials including written explanations and measurement tools were thoroughly reviewed and approved by Seoul National University's Institutional Review Board (IRB).

Procedures and Measures

Upon arrival at the laboratory, participants were escorted to a quiet room in which there was a desk and two chairs. There was a pen, a printed consent form, and the questionnaire on the desk. After listening to a brief explanation of the study's purpose, the participants signed the consent form and started the questionnaire. If a participant wanted to stop answering the questionnaire, they could terminate at any time; the questionnaire took 10 minutes to complete.

Grit.

Grit was measured by the Grit Scale (Duckworth et al., 2007), asking to what degree the participants agreed or disagreed with 12 statements (ranging from 1 = *not at all like me*; 5 = *very much like me*; sample statements: "My interests change from year to year" and "I am diligent"). All questions were translated from English into Korean (Lee, 2015). Back translation was performed to ensure the translated statements' accuracy. The Cronbach's alpha for grit was .68.

Theory of Intelligence.

Theory of intelligence was measured using the scale developed by Dweck (2006). Among the six questions, three items were based on the incremental theory of intelligence and three on the entity theory of intelligence. All items were rated on a five-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*; sample statement: “You have a certain amount of intelligence, and you really can’t do much to change it”). Answers were scored such that higher values indicated that intelligence was considered flexible. Since the original questions were in English, each question was translated into Korean and then back-translated so that it did not differ from the original question’s meaning. The Cronbach’s alpha for the theory of intelligence was .60.

Academic Achievement.

Academic achievement was assessed using a self-reported form for the following three subjects: Korean, math, and English (Kim & Yang, 2013). Participants were asked to rate them on a five-point Likert scale (1 = *very low* to 5 = *very high*; sample statement: “Please indicate what was your most recent final exam grade on math”) to reflect the results of the final exams. The Cronbach’s alpha for academic achievement was .73.

Results

The present study investigated the relationship between the theory of intelligence, grit, and academic achievement. We also examined the mediating effect of grit on the implicit theory of intelligence in relation to academic achievement. The data of this study were analyzed using SPSS version 24.

The mean, standard deviation, and range of each variable were first presented for data analysis, and then Pearson's correlation analysis was calculated. Next, a two-way analysis of variance was performed to derive the tendency of academic achievement depending on the level of grit and theory of intelligence. Furthermore, the effects of the theory of intelligence and grit on academic achievement were tested. After establishing the relationship between variables, we performed Baron and Kenny's three-step regression analysis and a Sobel test to determine the mediating effects of grit. Therefore, the present study demonstrates the psychological mechanisms of the three variables.

Descriptive statistics: Theory of Intelligence, Grit, and Academic Achievement

Descriptive statistics of the variables, including the theory of intelligence, grit, and academic achievement, were computed (see Table 1). The mean of the theory of intelligence was 22.91 ($SD = 6.33$) with range 6.00 – 36.00. Furthermore, the mean grit score was 36.08 ($SD = 5.79$) with range 19.00 – 51.00. Finally, the average academic achievement was 11.04 ($SD = 3.16$) with range 3.00 – 15.00.

Furthermore, we examined whether each independent variable had gender differences. As suggested by the results, the difference in grit scores between male ($M = 36.70$, $SD = 5.30$) and female participants ($M = 35.54$, $SD = 6.20$) was not significant; $t(104) = 1.03$, $p > .05$. Likewise, the implicit beliefs about intelligence did not differ between genders; $t(104) = -.78$, $p > .05$. Finally, there were no gender difference in academic achievement, $t(104) = -.98$, $p > .05$. Therefore, gender differences in each variable were not considered in the remaining study.

Table 1. *Descriptive Statistics of the Theory of Intelligence, Grit, and Academic Achievement*

Measure	Mean	S. D.	Range
Theory of intelligence	22.91	6.33	6.00 – 36.00
Grit	36.08	5.79	19.00 – 51.00
Academic achievement	11.04	3.16	3.00 – 15.00

The Relationship between Theory of Intelligence, Grit, and Academic Achievement

The relationship between the variables was examined using Pearson's correlation analysis (see Table 2). As shown in Table 2, implicit beliefs on intelligence and grit were positively correlated ($r = .43, p < .001$) and a positive correlation between theory of intelligence with academic achievement was observed ($r = .29, p < .001$). Finally, grit and academic achievement were also positively correlated ($r = .34, p < .001$).

Table 2. *Correlations Among Theory of Intelligence, Grit, and Academic Achievement*

	1	2	3
1. Theory of Intelligence	1	.43**	.29**
2. Grit		1	.34**
3. Academic Achievement			1

* $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed)

Differences in Academic Achievement by the Theory of Intelligence and Grit

Grit might affect academic achievement, although the effect might differ between the magnitude of the theory of intelligence. Therefore, survey responses were analyzed using two-way analysis of variance (ANOVA) with SPSS. A 2 (Theory of intelligence: low vs. high) x 2 (Grit: low vs. high) ANOVA was conducted for academic achievement. The levels of independent variables were divided by the median and labeled as low or high.

According to the results, the main effect of grit yielded an F ratio of $F(1, 102) = 5.67, p < .05$, meaning that individuals who had the entity theory of intelligence and a low level of grit had lower academic achievement ($M = 9.87, SD = 3.53$) than individuals with the entity theory of intelligence and a high level of grit ($M = 11.12, SD = 3.84$; see Table 3).

Table 3. *Academic Achievement in Low and High Levels of Theory of Intelligence and Low and High Grit*

		Theory of Intelligence	
		Low	High
Low	<i>M</i>	9.87	11.04
	<i>SD</i>	3.53	2.19
High	<i>M</i>	11.12	12.69
	<i>SD</i>	3.84	2.13

The pattern of results was identical regardless of the theory of intelligence. There was a significant main effect for the theory of intelligence on academic achievement, $F(1, 102) = 5.08, p < .05$. As can be seen in Table 3, participants with an incremental theory of intelligence and high levels of grit had better grades ($M = 12.69, SD = 2.13$) compared to those with a low level of grit, $M = 11.04, SD = 2.19$. Finally, there was no significant observed interaction between the implicit theory of intelligence and grit on academic achievement, $F(1, 102) = .109, p > .05$. The results are summarized in Figure 1.

Taken together, these analyses revealed the tendency of academic achievement based on the degree of grit and theory of intelligence. Moreover, the results demonstrated the hypotheses that both the theory of

intelligence and grit matter for academic achievement. This is the first evidence to explain the relationship between grit, theory of intelligence, and academic achievement in the Korean context to the best of our knowledge.

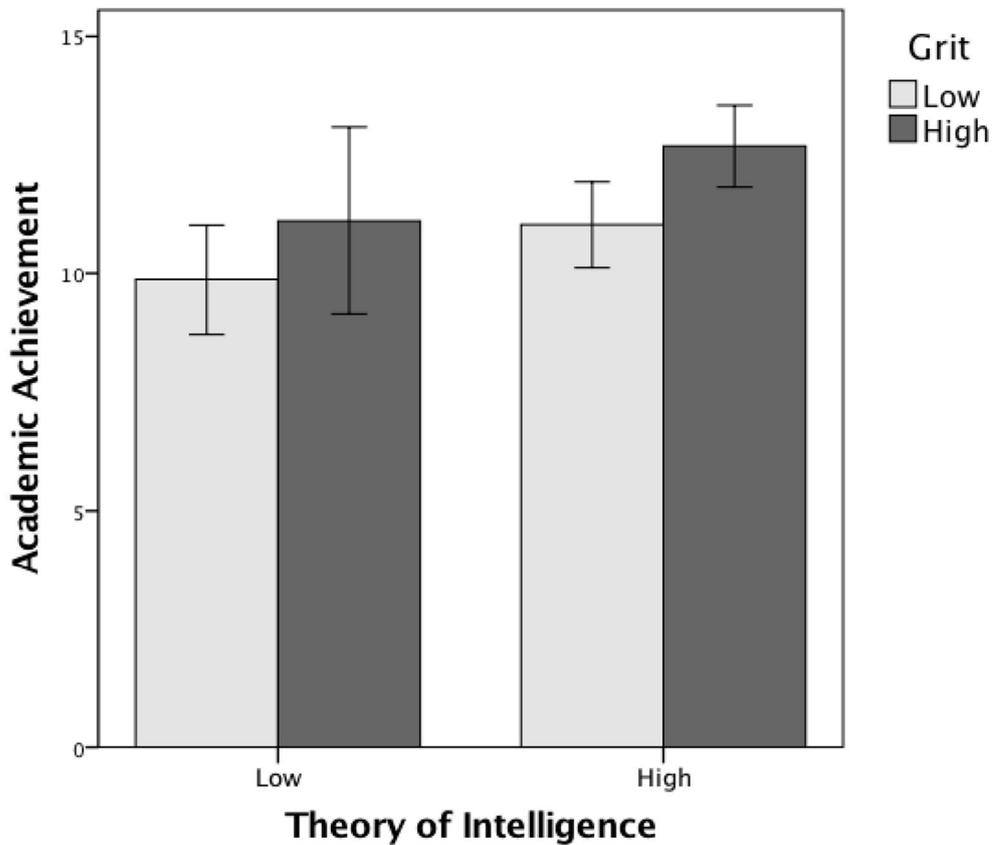


Figure 1. *Participants' Theory of Intelligence, Grit, and Self-Reported Academic Achievement.*

Note. Error bars represent 95% confidence intervals around the mean.

Effects of Implicit Theory of Intelligence and Grit on Academic Achievement

Multiple regression analysis was conducted as follows to investigate the effect of each variable on academic achievement: As can be seen in Table 4, the theory of intelligence is marginally related to academic achievement, $\beta = .18$, $t = 1.76$, $p < .1$. In addition, grit was significantly related to academic achievement, $\beta = .26$, $t = 2.58$, $p < .05$. The overall model significantly explained academic achievement with 14% variance.

Table 4. *Multiple Regression Analysis of the Theory of Intelligence and Grit Predicting Academic Achievement*

Variable	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>
(Constant)	3.86	1.85		2.09	< .05
Theory of intelligence	.09	.05	.18	1.76	< .1
Grit	.14	.06	.26	2.58	< .05
$R^2 = .14, F = 8.38 (p < .001)$					

Grit as a Mediator in the Relationship between Theory of Intelligence and Academic Achievement

Since the present study used a cross-sectional research design, there could have been multicollinearity between variables. Therefore, the variance inflation factor (VIF) was examined for all independent variables to discover any multicollinearity issues. Since no VIF exceeded the value of 10.00, it was assumed that multicollinearity was not present among the variables in this case.

Three-step regression analysis as proposed by Baron and Kenny (1986) was performed to verify the mediating effect of grit on the relationship between the implicit theory of intelligence and academic achievement. These steps have to be fulfilled for mediation analysis: (1) the independent variable significantly affects the dependent variable; (2) the independent variable significantly influences the mediator; and (3) the degree of effects of the independent variable on the dependent variable decrease or become insignificant when the mediator is controlled. In Step 3, it is identified whether the mediator fully or partially mediated the relationship between the independent and dependent variables.

In Step 1, the independent variable (theory of intelligence) predicted the mediator (grit) ($p < .001$) and significantly explained 19% of the

variance in grit ($p < .001$). In Step 2, the independent variable significantly (theory of intelligence) predicted the dependent variable (academic achievement) ($p < .01$). When the value of the independent variable increased, the value of mediator also increased ($B = .15$), with an R^2 of .08. In Step 3, the mediator (grit) was found to significantly predict the academic achievement ($p < .05$). However, the theory of intelligence was not found to significantly predict academic achievement ($p > .05$). Moreover, the standardized regression coefficient became insignificant and decreased from .15 to .09 (see Table 5). Therefore, grit completely mediated the relationship of the other variables. Indeed, theory of intelligence is only related to academic achievement through grit. The results are summarized in Figure 2.

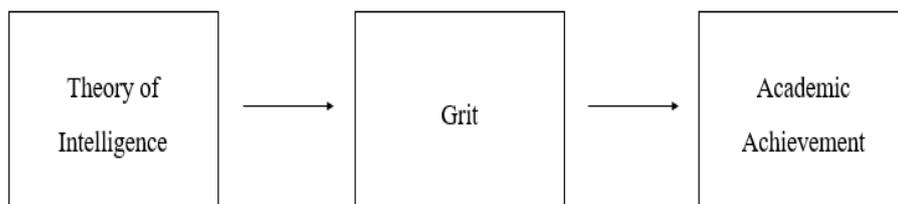


Figure 2. *Mediation Model for the Theory of Intelligence, Academic Achievement, and Grit*

Table 5. *Grit Mediating the Association between the Theory of Intelligence and Academic Achievement*

	Step 1	Step 2	Step 3
	Grit	Academic achievement	Academic achievement
(Constant)	27.06 ^{***}	7.71 ^{***}	3.86 [*]
Theory of intelligence	.39 ^{***}	.15 ^{**}	.09
Grit			.14 [*]
R ²	.19	.08	.14
F	23.68 ^{***}	9.58 ^{**}	8.38 ^{***}

* $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed)

Although three-step regression analysis as proposed by Baron and Kenny (1986) is the typical approach to test mediation analysis in psychology research, some researchers have criticized this approach as statistically insufficient due to its low statistical power (LeBreton, Wu, & Bing, 2009). Therefore, a Sobel test was additionally performed in the present study to test the mediating effects of grit on the effects of implicit beliefs about intelligence on academic achievement.

As shown in the results, the mediating effect of grit was found ($z = 2.29, p < .05$). The higher the implicit belief in intelligence ($B = .39$), the higher the grit and the higher the academic achievement; the indirect effect of implicit belief of intelligence on academic achievement was $.06$ ($B = .39 * .14$; see Table 6).

Table 6. *Sobel Test Statistics of the Mediating Role of Grit between the Theory of Intelligence and Academic Achievement*

	<i>B</i>	<i>SE</i>	<i>z</i>	<i>p</i>
Theory of intelligence → Grit	.39	.08	2.29	< .05
Grit → Academic achievement	.14	.06		

Discussion

The results of this study are as follows. First, we found that grit at age 14 is related to academic achievement. Those who were gritty were more likely to have better grades at school. Second, individuals' theory of intelligence was related to grit, meaning that individuals with the growth mindset were more likely to have grit. Finally, grit fully mediated the relationship between the implicit belief of intelligence and academic achievement. The results of the study were similar to the study conducted by Kim and Park (2017).

The present study is important in that it is the first to examine the correlation and interactions between these variables among Korean adolescents. This study showed that grit and implicit beliefs about intelligence might play important roles in academic achievement. Thus, improving grit and perspectives on intelligence can help individuals improve their academic achievements. For example, if Korean youths who are stressed and exhausted due to academic achievement may be able to improve their performance by changing their perspective on the variability of ability and developing passion and perseverance towards long-term goals. These findings provide meaningful implications for parents and teachers of

adolescents about what interventions are necessary for Korean teens.

The present study has several limitations. First, individuals' academic achievements were measured via self-reporting rather than GPA, which could compromise the assessment's objectivity. However, as suggested in several previous studies, self-reported grades are also reliable indicators of academic success. For example, according to Cole and Gonyea (2010), self-reported ACT scores and actual ACT scores were highly correlated ($r = .95$); many other studies have also supported these findings (e.g., Cassady, 2001; Herman 2003; Kuncel, Crede, & Thomas, 2005). However, in future research, it would be necessary to verify whether GPA or other performance indicators would yield similar results. The second limitation of the present study is our adoption of a cross-sectional study; as a result, the relationships between variables were examined concurrently and the causal relationship between variables remained unclear. Therefore, further longitudinal studies would be necessary; in addition, it would also be advisable to conduct an intervention study.

Third, grit was examined as the total score in the present study, i.e. the combination of two facets: consistency of interest and perseverance of effort. Duckworth and colleagues (2007) argued that both factors equally represent grit, and it has therefore become conventional among many researchers to

only report the overall grit score. However, several recent studies have argued that components of grit should be examined independently rather than in combination, as several studies have demonstrated results that contradict Duckworth et al.'s (2007) conclusion, one of the two factors was a stronger predictor of success than the other.

For example, Bowman, Hill, Denson, & Bronkema (2015) examined the relationship between grit and GPA by conducting research with undergraduate students in the United States while controlling for certain variables that could affect academic achievement. Interestingly, although perseverance of effort was found to be a significant predictor of academic achievement, the consistency of interest was not. Similar results were reported in various studies (Muenks, Wigfield, Yang, & O'Neal, 2017; Wolters & Hussain, 2015). Therefore, it seems necessary in further research to analyze grit with each sub-dimension.

Study 2

The results reported in Study 1 suggest that an individual's theory of intelligence is related to that person's grit. Furthermore, we found that individuals with grit are more likely to have high academic accomplishments. Besides, the relationship between someone's theory of intelligence and their academic attainment were completely mediated by that individual's degree of grit. In summary, the results of Study 1 underscored the importance of grit in Korean youths and revealed the relationship between the three variables.

In Study 2, grit, which has only been studied as a predictor variable, will be approached longitudinally to examine which variables in childhood predict grit in adolescence. In addition, as mentioned in the discussion section of Study 1, the sub-dimensions of grit should be analyzed separately to explore the predictive variables of grit in greater depth.

People with grit do not give up when things are going poorly, and keep trying to achieve their ultimate goal. Grit was shown to be a reliable predictor of success in various studies (Duckworth et al., 2007, Duckworth & Quinn, 2009; Duckworth, Quinn, & Seligman, 2009; Duckworth, Kirby, Tsukayama, Berstein, & Ericsson, 2011; Lee & Sohn, 2013; Duckworth &

Quinn, 2009; Salles et al., 2014; Stayhorn, 2014). Thus, what predicts grit? No previous empirical study has explored the predictors of grit to the best of our knowledge. Since we demonstrated the relationship between grit and success in Study 1, we will investigate whether predictors of individual success such as parental education level, unrealistically optimistic beliefs, and delay of gratification can predict grit in Study 2.

Parental Education Level and Grit

According to Bronfenbrenner's ecological theory, parents have a great influence on their children (Bronfenbrenner, 1986; Schlechter & Milevsky, 2010). Previous studies have demonstrated that parental education level is a significant predictor of child achievement (Dearing, McCartney, & Taylor, 2006; Davis-Kean, 2005; Duncan, Brooks-Gunn, & Klebanov, 1994; Haveman & Wolfe, 1995; Klebanov, Brooks-Gunn, & Duncan, 1994; Nagin & Tremblay, 2001). Some researchers have shown that parents with a high level of education can provide a better environment for promoting their children's development (Davis-Kean, 2005; Zeytinoglu, Calkins, Swingler, & Leerkes, 2017) because individuals with a high socioeconomic status are less likely to experience stressful events, which helps them become more active and more supportive of their children (Zeytinoglu et al., 2017).

Indeed, parental education level and sensitive parenting are interrelated variables according to Tamis-Lemonda, Shannon, Cabrera, and Lamb (2004), which suggests that parents with a higher education level are more sensitive to their children's needs and are faster in attending to those needs. Thus, parents with a high level of education may have more time to teach their children the importance of self-regulatory behavior, which might result in better self-regulation among those children (Zeytinoglu et al., 2017). The same is true for grit. Parents who value patience and effort in achieving long-term goals may be better able to explain the importance of grit to their children, which can directly influence their children's level of grit.

Another potential reason why parental education level affects children's grit can be explained by Bandura's social cognitive theory. According to this theory, individuals develop their behavior by observing others (Bandura, Ross, & Ross, 1961; Dubow, Boxer, & Huesmann, 2009). This affects behavior, values, and beliefs (Dubow et al., 2009). Therefore, a child may also be able to gain a high level of grit by instinctively learning from their parents. In fact, a recent study found an interrelationship between parents' effortful control and their children's self-regulation (Zeytinoglu, 2017).

According to the results reported by Duckworth and colleagues (2007),

individuals with grit are more likely to attain a high level of education. From this perspective, it can be assumed that parents with a high level of education are more likely to have high levels of grit and children can learn from their parents' high grit. According to Leonard, Lee, and Schultz (2017), observing parents' persistence made even very young infants try to steadfastly accomplish tasks. Based on these studies, we can hypothesize that children with highly educated parents will have higher grit when they become adolescents, compared to children whose parents have a lower level of education.

Unrealistically Optimistic Beliefs and Grit

Individual's optimism is another factor that can be implicated in success (Crane & Crane, 2007). Optimism may manifest as unrealistically optimistic beliefs in four-year-old children (Choi & Kwak, 2007; Kim & Kwak, 2011). An unrealistically optimistic belief is a "cognitive bias" in which facts regarding a person's own abilities or future are overestimated (Bjourklund, 2009; Kim & Kwak, 2011). This belief shows up around the age three and continually appears until mid-childhood (Benenson & Dweck, 1986; Boseovski & Lee, 2006; Choi & Kwak, 2007; Heyman & Giles, 2004; Heyman & Legare, 2005).

At this developmental period, unrealistically optimistic beliefs operate as protective optimism in childhood, and this is crucial to a child's development (Bjorklund & Green, 1992; Lockhart, Goddu, & Keil, 2017). For example, suppose a child fails to tie their shoelaces, because they do not know how to do it. In this situation, if children are pessimistic, they will stop trying after failing a challenging task. However, unrealistically optimistic children will continually endeavor and believe that they can do it. The child will naturally learn how to tie their shoelaces through these attempts. In this manner, children are more likely to be more optimistic about their ability to adapt to new situations. In fact, Choi and Kwak (2007) showed that optimistic beliefs are related to more positive self-perception. In addition, optimistic beliefs have an important adaptive value, particularly in challenging situations, which lends positive strength to an individual.

While some research on optimism and grit in adults is available (e.g., Duckworth et al., 2009; Singh & Jha, 2008), no previous study has directly examined the causal relationship between optimism and grit in children to the best of our knowledge. According to Singh and Jha (2008), grit has a positive correlation with positive emotions, happiness, and life satisfaction. Furthermore, Duckworth and colleagues (2009) showed that gritty individuals tend to be optimistic. Individuals with an optimistic explanatory

style believe that the painful situations that occur to them do not apply to all situations, but are instead situation specific. They also believe that these situations can be changed. This optimism might enhance individuals' resilience (Duckworth et al., 2009), and positively affect their grit. Therefore, it can reasonably be expected that unrealistically optimistic children would gain grit at age of 14.

Delay of Gratification and Grit

Another factor that can affect grit is the ability to delay gratification, which is known to be a predictor of success. Delay of gratification is the ability “to forgo immediately available rewards in pursuit of more preferred but distal goals” (Duckworth, Tsukayama, & Kirby, 2013; Kim & Kwak, 2014, 2015; Peake, 2017). Delay of gratification is primarily measured via the task known as the marshmallow test. It is associated with one's self-control ability rather than reward-related impulses (Duckworth, Tsukayama, & Kirby, 2013). This ability is mainly measured at four years old, because the children should be able to sufficiently control themselves to delay gratification and be cognitively mature. First, a child should be able to understand the value of quantity. In other words, the child must be able to

correctly judge which of two rewards is greater. In addition, a child should be able to understand lengths of time. By age three, children have started to understand the duration of experiences, but they still experience difficulties fully understanding the temporal distance of events. Between ages four and five, children start to understand it (Steelandt, Thierry, Broihanne, & Dufour, 2012); therefore, the ability to delay gratification stabilizes at around four years old.

Many studies have demonstrated that the ability to delay gratification in four-year-olds is positively related to their adaptive functioning. For instance, Mischel and colleagues (1988) showed that waiting time at age four was related to adolescent functioning. More specifically, the parents of those children who were able to wait for larger but later rewards at age four rated them as both academically and socially competent in adolescence. They were also evaluated to be rational, well-focused, well-organized, and able to deal well with frustration and stress. This pattern of results did not depend on gender (Mischel, Shoda, & Peake, 1988).

In addition, participants who were good at delaying gratification at age four were more likely to have a high SAT scores than those who were unable to wait (Shoda, Mischel, & Peake, 1990). Moreover, recent studies showed that children who did well in a delay of gratification task were more

likely to exhibit a low BMI at age 39 (Schlam, Nicole, Shoda, Mischel, & Ayduk, 2013). Taken together, the results of the studies above suggest that the paradigm of delayed gratification is significant in that a longer waiting time in childhood is related to well-being later in life.

Recently, Duckworth and Eskreis-Winkler (2013) suggested that the ability to delay gratification is a precursor to grit, although no empirical studies are currently available that substantiate this contention. However, achieving long-term goals and maintaining interest and willingness to make efforts requires the ability to delay gratification in the moment (Duckworth & Eskreis-Winkler, 2013). In addition, children who could wait in front of an immediate reward became more competent and successful (Mischel et al., 1988; Shoda et al., 1990). Moreover, people with high grit were more likely to succeed later in life (Duckworth et al., 2007, Duckworth & Quinn, 2009; Duckworth, Quinn, & Seligman, 2009; Duckworth, Kirby, Tsukayama, Berstein, & Ericsson, 2011; Lee & Sohn, 2013; Duckworth & Quinn, 2009). In this context, investigating the relationship between delay of gratification and grit is essential (Duckworth & Eskreis-Winkler, 2013). Based on the results of previous studies, we hypothesized in Study 2 that delay of gratification at age four can predict one's grit in adolescence.

Research Questions and Hypotheses

Study 2's main research question is as follows: Can the four-year-olds' parental education level, unrealistically optimistic beliefs, and ability to delay gratification predict their grit at 14 years old? Accordingly, we expected that all three variables (parental education level, unrealistically optimistic beliefs, and the ability to delay gratification) could predict adolescents' grit.

Method

Participants

One hundred and six adolescents (of whom 56 were female) living in Seoul and Gyeonggi province participated in this study. The participants were the same as those in Study 1. At the data collection times, the average age of the children was first 4.33 and then 13.98 years old. Research on parental education level, unrealistically optimistic belief, and delay of gratification were conducted at age four, and grit was measured at age 14. All participants participated voluntarily.

When the participants were four years old, a detailed written explanation about the study, including the aims and data storage, was provided to their parents. In addition, more detailed information was delivered orally to parents and their children and answers were provided for any further questions. Afterwards, participants' parents signed informed consent forms.

When the participants were 14 years old, explanations about the study were provided to participants directly, since they were then able to fully understand the instructions and express their opinions. All participants signed the informed consent forms and participated the study of their own

free will. Before the study was launched, all materials, procedures, and aims of the study were reviewed and approved by the Institutional Review Board (IRB) at the researcher's institution.

Procedures and Measures

The parental education level, unrealistically optimistic beliefs, and delay of gratification were measured at age four. Testing took place at Seoul National University laboratory; when each child came to the laboratory at the scheduled time, they were escorted to a designated room. Trained research assistants assessed the children one-on-one and all procedures were administered by a female experimenter. The data on the delayed gratification task and unrealistically optimistic beliefs were collected, while participants' caregivers completed questionnaires in a separate room.

Parental Education Level.

Each child's demographic characteristics, including parental education level, were collected when they were four years old. Parents reported the highest level of education they had completed in the range 1 – 5. For example, 3 meant that they had completed an associate's degree or equivalent.

Delay of Gratification.

The delay of gratification paradigm developed by Mischel and Baker (1975) was modified and used in the present study (Chong & Son, 1995; Kim & Kwak, 2015). The task was conducted with a trained experimenter and a child in a separate room. There was one table and two chairs facing each other in the room and there was a sheet of paper and two dishes with rewards on the table. Before starting the task, the participant and experimenter played with a bell for a few minutes to form a rapport so that the child could come to trust the experimenter. After the child felt comfortable in the experimenter's presence, they were asked to choose their favorite reward among a few sweets (e.g. jelly, candy, marshmallow, or chocolate). When the participant chose a reward, this was used in the remainder of the study.

The researcher explained that there were two kinds of rewards: immediate and delayed. Then, the child was asked whether they preferred one or two rewards. All children who participated in the present study replied that two delayed rewards were preferable to one immediate reward. This question was asked to ensure that the child considered delayed rewards more desirable than immediate ones and to confirm that each child was fully motivated.

In the next step, the experimenter explained to the child that they could ring the bell to get the experimenter to return to the room at any time. As a rehearsal, the experimenter went out of the room and immediately returned when the child pressed the bell. After several repetitions, the child fully realized that the experimenter would return whenever they rang the bell. Subsequently, the experimenter explained to the child that she had to leave the room for a certain period of time and asked the child to wait until she came back to get two rewards. The participants were told that if they were unable to wait or decided not to wait, they could press the bell at any time. The children were informed that they could only get one reward in that case.

The experimenter asked the participants several questions before leaving the room such as: “How many rewards can you get if you wait until I come back to room?” “What should you do if you want me to come back?” “How many rewards can you get if you ring the bell and I come back?” If the participant answered these questions correctly, it was regarded that they understood the procedure well. Then, the experimenter left the room. Whenever the participant pressed the bell, the experimenter immediately returned to the room and gave the child a reward as promised. If the child did not ring the bell and waited, the researcher returned in 15 minutes and gave the child two rewards. All of the children’s reactions were recorded on

video.

After the experiment, the experimenter and the child played with the bell, just as they had at the beginning of the experiment. In addition, a gift was provided to all participants to alleviate any negative feelings that they might have felt during the study. The waiting period was analyzed in the present study.

Unrealistically Optimistic Beliefs.

A trained experimenter conducted this study with a child in a separate room. The measurement of unrealistically optimistic beliefs was originally developed by Lockhart and colleagues (2002) to investigate children's beliefs about the trait stability. In the present study, it was modified and adopted for Korean children according to Choi and Kwak (2007). Two conditions were provided in this task: the positive change of negative traits and the maintenance of positive traits. It was assumed that positive changes of negative characteristics might be why the child was optimistic; however, it might simply be because the child recognized the possibility of change in the outside world. Therefore, to accurately measure the child's optimistic beliefs, both conditions in which negative traits changed positively and the condition in which positive qualities were maintained consistently were included. If the children were sufficiently optimistic, the negative traits

would change positively while positive qualities would remain positive. However, if the children simply thought that traits could change, the maintenance condition could also change in the opposite direction. In the present study, the sum of both conditions was used in further analysis.

Each condition included three biological and three psychological qualities, and each presented six scenarios. Six stories for each condition were randomly presented to participants. In the condition of the positive changes of negative qualities, the experimenter presented six short stories in which the main character had certain traits that they wanted to change. A child with no fingers, a child with freckles, a child with bad eyesight, and a dirty child are some examples of scenarios. The condition of maintaining positive qualities also had six short stories about a positive trait: a tall child, a child with good eyesight, a child with nice skin, a neat child, a sociable child, and a brave child. The experimenter explained to the participants that the traits were stable when the main character became 5 and 10 years old. Then, each child was asked to imagine what would happen when the main character became an adult if the main character received no outside manipulation or intervention until they reached adulthood. The gender of the main character and each participant were matched accordingly.

After choosing a negative or positive change in the main character, the

children were asked to indicate how much they believed in the change of traits by pointing to one of four circles that varied in size (corresponding to a four-point Likert scale, with bigger circles corresponding to stronger beliefs in change). The scenario of “the child without one finger” was an exception and scored on a three-point scale. The details were as follows: “The child still had four fingers” (= 1 point), “The child had five fingers, but one of them was still slightly smaller” (= 2 points), and “the child had five fingers” (= 3 points).

Grit.

At age 14, grit was measured as described above in Study 1.

Results

All analyses were performed using SPSS Statistics version 24. We examined the predictive value of parents' education level, unrealistically optimistic beliefs, and delay of gratification in adolescents' grit. Preliminary analyses including descriptive statistics of the variables were computed for the analyses and the means, standard deviations, and ranges of each scale were reported. Then, the relationships between variables were investigated and stepwise multiple regression was used to explore the predictors of grit at age 14. In addition, unlike in Study 1, we also analyzed the predictors of grit using two sub-dimensions: consistency of interest and perseverance of effort.

Descriptive Statistics: Parents' Education Level, Delay of Gratification, Unrealistically Optimistic Beliefs, and Grit

The results of frequency analysis for parents' education level were as follows. Regarding fathers, 2.8% ($n = 3$) were high school graduates or had an associate's degree, 80.2% ($n = 85$) had a bachelor's degree, and 17% ($n = 18$) were post-college graduates. For mothers, 19.8% ($n = 21$) were high school graduates or had an associate's degree, 70.8% ($n = 75$) were had a bachelor's degree, and 9.4% ($n = 10$) were post-college graduates.

Likewise, the mean, standard deviation, and range of each variable were calculated (see Table 7). The mean of delayed gratification was 202.91 ($SD = 93.67$), with range 40.00 – 450.00 and the average score for unrealistically optimistic beliefs was 35.35 ($SD = 8.37$), with range 12.00 – 53.00. The means of each subscale were as follows: negative to positive ($M = 15.46$, $SD = 5.88$) and positive to positive ($M = 19.89$, $SD = 5.14$).

Finally, the mean for grit was 36.08 ($SD = 5.79$), with range 19.00 – 51.00. Duckworth et al (2007) was the first to suggest that grit was composed of two factors. Thus, two factors of descriptive statistics were described separately in the present study. The means of each sub-dimension were as follows: consistency of interest ($M = 16.76$, $SD = 3.42$) and perseverance of effort ($M = 19.32$, $SD = 3.73$).

Table 7. *Descriptive Statistics of Delay of Gratification, Unrealistically Optimistic Beliefs, and Grit*

Measure	Mean	S. D.	Range
Delay of Gratification	202.91	93.67	40.00 – 450.00
Unrealistically Optimistic Beliefs	35.35	8.37	12.00 – 53.00
Unrealistically Optimistic Beliefs_np	15.46	5.88	6.00 – 23.00
Unrealistically Optimistic Beliefs_pp	19.89	5.14	6.00 – 30.00
Grit	36.08	5.79	19.00 – 51.00
Consistency of Interest	16.76	3.42	8.00 – 28.00
Perseverance of Effort	19.32	3.73	11.00 – 30.00

Note. np = negative to positive, pp = positive to positive

The Relationship between Delay of gratification, Unrealistically Optimistic Beliefs, and Grit

Table 8 presents the correlation among each variable. Congruent with our expectations, consistency of interest and perseverance of effort, which are subscales of grit, were positively correlated ($r = .31, p < .01$). Furthermore, the total score for grit was positively correlated with consistency of interest ($r = .79, p < .001$) and perseverance of effort ($r = .83, p < .001$).

Likewise, positive correlations were found between delay of gratification and perseverance of effort ($r = .34, p < .001$) and between delay of gratification and the total score for grit ($r = .25, p < .05$), but not with consistency of interest ($r = .05, p > .05$). In addition, the father's and mother's education levels were positively correlated ($r = .37, p < .001$). No interrelations were observed between other variables.

Table 8. *Correlations between Unrealistically Optimistic Beliefs, Delay of Gratification, and Grit*

	1	2	3	4	5	6	7	8	9
1. Father's Education Level	1	.37***	.01	.17	.17	.08	.08	.08	.04
2. Mother's Education Level		1	.08	.09	.05	.08	.00	-.12	.10
3. Delay of Gratification			1	.15	.24*	-.04	.25*	.05	.34***
4. Unrealistically Optimistic Beliefs				1	.79**	.72**	-.05	-.02	-.06
5. Unrealistically Optimistic Beliefs_np					1	.15	-.03	.01	-.05
6. Unrealistically Optimistic Beliefs_pp						1	-.06	-.04	-.05
7. Grit							1	.79***	.83***
8. Consistency of Interest								1	.31**
9. Perseverance of Effort									1

* $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed)

Exploring Childhood Variables Predicting Adolescence Grit

Prior to regression analysis, the variance inflation factor (VIF) was computed for each variable to detect multicollinearity issues. The results showed that all VIFs were under 10; therefore, multicollinearity was not an issue. Next, the Durbin-Watson test was run to show that there was no serial dependency. Thus, these data were proper for conducting regression analysis.

Stepwise multiple regression analysis was performed to check which variable could most closely predict grit. The results confirmed that only the ability of delayed gratification at age four ($B = .02, p < .05$) significantly predicted grit in the adolescent period, with $R^2 = .06$ (see Table 9). This meant that the children who could endure the delay of gratification task at age four were more likely to have grit at age 14. However, neither the mother's education level nor unrealistically optimistic beliefs at age four were significant predictors of grit at age 14. These findings suggest that an increase in delay of gratification at age four leads to an increase in grit in adolescence.

Table 9. *Stepwise Multiple Regression of Parental Education Level, Unrealistically Optimistic Beliefs, and Delay of Gratification in Relation to Grit*

	<i>B</i>	β	R^2	ΔR^2	<i>F</i>
(Constant)	32.97				
Delay of gratification	.02	.25*	.06	.05	6.84*

* $p < .05$, ** $p < .01$, *** $p < .001$

Additionally, as specified above, two facets of grit were separately analyzed. Interestingly, different results were obtained depending on the facets of grit. With regard to consistency of interest, no independent variables predicted consistency of interest in the adolescence period. However, the results confirmed that delay of gratification at age four ($B = .01$, $p < .001$) significantly predicted perseverance of effort at age 14, with $R^2 = .11$ (see Table 10). These results suggested that children who delayed their immediate gratification at age four were more likely to continue their efforts at age 14.

Table 10. *Stepwise Multiple Regression of Parental Education Level, Unrealistically Optimistic Beliefs, and Delay of Gratification in Relation to Perseverance of Effort*

	<i>B</i>	β	R^2	ΔR^2	<i>F</i>
(Constant)	16.59				
Delay of gratification	.01	.34***	.11	.11	13.44***

* $p < .05$, ** $p < .01$, *** $p < .001$

Discussion

The significance of the results we obtained in Study 2 is that we found the predictors of grit using a longitudinal research design. This is the first empirical study in which grit's predictive variables have been extensively investigated from a developmental psychological perspective. From a longitudinal perspective, parental education level, unrealistically optimistic beliefs, and delay of gratification were examined to determine whether each variable predicted grit at the age of 14.

The results suggest, however, that parents' education level did not predict grit in youth. In addition, children's unrealistic optimism did not predict their grit when they became teenagers. This might be why children's unrealistically optimistic beliefs decreased around 10 years old (Benenson & Dweck, 1986; Boseovski & Lee, 2006; Heyman & Giles, 2004; Heyman & Legare, 2005). Moreover, while unrealistic optimism appears to be adaptive in childhood (Choi & Kwak, 2007), it can adversely affect achievement afterwards. If the reality is not recognized adequately, individuals will have fantasies of being superior and thus invest insufficient efforts in performing the tasks at stake (Jefferson, Bortolotti, & Kuzmanovic, 2017; Oettingen & Wadden, 1991). In addition, if individuals are too

optimistic, they may not be able to achieve their ultimate goal by paying too much attention to too many goals together, with lack of focus on a single one that they wish to attain.

The results of Study 2 showed that the ability to delay gratification at the age four affects grit at the age of 14. In other words, someone who can reconcile conflicts between sub-goals (Duckworth & Gross, 2014), restrain current impulses, and wait for greater rewards is less likely to give up on their ultimate goal and will consistently pursue their goals afterwards.

In addition, when the two factors of the grit were analyzed separately, delay of gratification predicted the perseverance of effort, but not consistency of interest. Being good at delay of gratification requires that children constantly put effort into waiting for bigger but later rewards, such as by using distraction strategies rather than consistently focusing on the rewards immediately in front of them (Mischel, Ebbesen, & Zeiss, 1972). This might be why the ability to delay gratification only affected the perseverance of effort rather than also the consistency of interest.

The results of the present study showed that duration of delay at age four significantly predicted overall grit with $R^2 = .06$ and perseverance of effort, with $R^2 = .11$. Allowing that the present study was a 10-year longitudinal

study, the degrees of coefficients are high compared to other previous longitudinal studies. For instance, according to Schlam and colleagues (2013), waiting time accounted for 4% of BMI after three decades while controlling for gender.

Alongside the significance of the results of Study 2 reported above, several limitations in this study must be acknowledged. First, the participants of the present study have been a part of the research since they were one month old. Due to the nature of the longitudinal study, many participants dropped off over time. Naturally, the socio-economic status of the remaining participants was high compared to the regular group. Thus, the participants' parental education level was quite high in the present study. Most parents in this study had graduated from college. Therefore, it is necessary to confirm whether these results are the same in various groups in further research, particularly in populations with a low SES.

Second, observing the full impact of parental education level on a child's grit may require controlling for other SES-related factors such as parental income, which might be a more powerful predictor than parental education level (Dubow, Boxer, Huesmann, 2009). In addition, there may have been changes in participants' socioeconomic statuses over the 10-year period. Therefore, it is necessary to reconsider and control the current socio-

economic status (income, education level, mother's employment status, etc.)

Finally, the present study analyzed two sets of data: when the participants were 4 and 14 years old. This might suggest the necessity of exploring the developmental pathways of grit by examining variables between these two points; therefore, a study with the aim of identifying the mediating variable when participants entered elementary school or middle school could provide a more thorough and detailed picture of grit's development in children.

General Discussion

The results of Study 1 indicate that the implicit beliefs that intelligence is related to grit, and that grit is related to academic achievement. In addition, we found that grit is a mediator in the relationship between one's theory of intelligence and academic achievement. In other words, when someone believes that intelligence or abilities can be improved with effort, they are more likely to have grit. Then, this passion and patience for long-term goals can lead to high academic accomplishments. Many Korean youths are concerned about their academic grades and, as a matter of fact, 67.8% of Korean youths spend a lot of time in private tutoring to improve their grades (Cho, 2017). In the light of these realities, the results of the present study give hope to those students, because the results suggest that changing individuals' perception of their abilities and having grit can bring a high academic achievement. These findings reaffirm the importance of changing viewpoint on intelligence and cultivation of grit.

Furthermore, our results in Study 2 suggested that the ability to delay gratification at age four predicts grit in adolescence. Essentially, we found that children who were not good at delaying gratification were more likely to experience difficulties concentrating on their long-term goals when they

became adolescents. Therefore, we can conclude that delaying immediate gratification for a larger goal in childhood can lead to patience and perseverance towards long-term goals later in life. That is, the ability of four-year-olds to overcome momentary impulses and wait in front of the marshmallow can be the driving force of power to achieve long-term goals ten years later. The ability to control controversies between their sub-goals and behavior can also lead to a better resolution of the struggle while they face conflicts on their way towards long-term goals.

The present study has important implications, in that it is the first study to study grit from a developmental psychological perspective. In addition, it is significant that we have searched for grit longitudinally to investigate what predicts it. Many adolescents are involved in risky behaviors, such as drug abuse and dropping out of school, due to the characteristics of developmental stage (Duckworth, Kim, & Tsukayama, 2013). However, adolescents with high grit will have a higher probability of not engaging in such dangerous behaviors, because they are more likely to focus on their long-term goals. Therefore, in terms of prevention, grit is important for youths. By exploring the variables that are the precursors of grit, we can prevent adolescents from having a low grit.

Meanwhile, several limitations of the present study should be noted as

they imply directions for future research. First, grit should be examined in various contexts. According to a recent meta-analysis of grit, its effects have only been demonstrated only in well-defined and difficult tasks, such as military selection courses and Spelling Bee competitions (Crede et al., 2017). Since most grit studies focus on academic achievement (Duckworth et al., 2007; Lee & Sohn, 2013; Stayhorn, 2014), studying the effects of grit in various tasks is essential.

In the present study, grit was measured via self-reporting. However, teenagers are particularly sensitive to what others think of them. Consequently, youths may answer the questionnaire based on social desirability; therefore, it is necessary to measure grit in a more objective manner. Rather than using self-reporting, the responses of teachers or parents should perhaps be collected. Alternatively, individuals' diaries or autobiographies can be analyzed to identify how hard they have strived for their long-term goals (Lim, 2017; Robertson-Kraft & Duckworth, 2014).

Third, it is also necessary to explore further variables as future predictors of grit. The present study only examined three relevant variables and we did not consider any genetic components. It would also be meaningful to examine the relationship between grit and temperament measured during childhood in future research to see whether a child with a particular

temperament has higher grit later in life.

Finally, there is a limit to the grit variable itself. Some psychologists portray grit as “old wine in new bottles” (Crede et al., 2017). Although Duckworth and colleagues (2007) stated that grit has stronger predictive power for the achievement of long-term goals than other variables, how it differs from existing psychological constructs should be further reviewed. Besides, the inconsistency of previous study results means that grit’s structure should also be revisited. As mentioned earlier, several studies have demonstrated that one element of grit seemed to predict success more strongly than others (Bowman, Hill, Denson, & Bronkema, 2015; Muenks et al., 2017; Wolters & Hussain, 2015). Consistent with this trend, only the perseverance of effort was related to delay of gratification at age four in our results.

In summary, the results of Studies 1 and 2 reported in the present study underscore the importance of adolescent’s grit and shed more light on grit’s predictive variables. Our finding that the ability to delay gratification in childhood predicts grit in adolescence suggests that caregivers and teachers need to elaborate early interventions for children with a low delay of gratification ability to prevent low grit levels in these children when they grow up.

Reference

- Bandura, A., Ross, D., & Ross, S. A. (1961). Transmission of aggression through imitation of aggressive models. *Journal of Abnormal and Social Psychology, 63*(3), 575-582.
- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182.
- Barrick, M. R., Mount, M. K., & Strauss, J. P. (1993). Conscientiousness and performance of sales representatives: Test of the mediating effects of goal setting. *Journal of Applied Psychology, 78*, 715-722.
- Baumeister, R. F., & Heatherton, T. F. (1996). Self-regulation failure: An overview. *Psychological Inquiry, 7*(1), 1-15.
- Bazelais, P., Lemay, D. J., & Doleck, T. (2016). How Does Grit Impact College Students' Academic Achievement in Science?. *European Journal of Science and Mathematics Education, 4*(1), 33-43.
- Baek, S. G. (2016, Jan). Korea's Social Trend Report released by the National Statistical Office, Retrieved from <http://monthly.chosun.com/client/news/viw.asp?ctcd=C&nNewsNumb=201601100036>

- Benenson, J. F., & Dweck, C. S. (1986). The development of trait explanations and self-evaluations in the academic and social domains. *Child Development, 57*(5), 1179-1187.
- Bjorklund, D., & Green, B. (1992). The adaptive nature of cognitive immaturity. *American Psychologist, 47*, 46-54.
- Bjorklund, D. F. (2009). *Why youth is not wasted on the young: Immaturity in human development*. New York: John Wiley and Sons.
- Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development, 78*(1), 246-263.
- Blalock, D. V., Young, K. C., & Kleiman, E. M. (2015). Stability amidst turmoil: Grit buffers the effects of negative life events on suicidal ideation. *Psychiatry Research, 228*(3), 781-784.
- Boseovski, J. J., & Lee, K. (2006). Children's use of frequency information for trait categorization and behavioral prediction. *Developmental Psychology, 42*(3), 500-513.
- Bowman, N. A., Hill, P. L., Denson, N., & Bronkema, R. (2015). Keep on truckin' or stay the course? Exploring grit dimensions as differential predictors of educational achievement, satisfaction, and

intentions. *Social Psychological and Personality Science*, 6(6), 639-645.

Bronfenbrenner, U. (1986). Ecology of the family as a context for human development: Research perspectives. *Developmental Psychology*, 22(6), 723-742.

Cassady, J. C. (2001). Self-reported GPA and SAT: A methodological note. *Practical assessment, Research and Evaluation*, 7(12), 1-6.

Cho, Y. J. (2017, Apr 18). 67.8% of elementary and junior high school students receive private tutoring, Retrieved from <http://www.asiae.co.kr/news/view.htm?idxno=2017041809240691126>

Choi, S., & Kwak, K. (2007). Unrealistically optimistic beliefs in young children: relation to psychological adjustment. *The Korean Journal of Developmental Psychology*, 20(4), 59-80.

Chong, Y. S., & Son, J. K. (1995). Preschool children's delay of gratification as a function of reward-recipients. *Korean Journal of Psychology: Developmental*, 8(1), 136-147.

Cole, J. S., & Gonyea, R. M. (2010). Accuracy of self-reported SAT and ACT test scores: Implications for research. *Research in Higher Education*, 51(4), 305-319.

- Crane, F. G., & Crane, E. C. (2007). Dispositional optimism and entrepreneurial success. *The Psychologist-Manager Journal*, *10*(1), 13-25.
- Crede, J., Wirthwein, L., McElvany, N., & Steinmayr, R. (2015). Adolescents' academic achievement and life satisfaction: the role of parents' education. *Frontiers in Psychology*, *6*, 1-8.
- Credé, M., Tynan, M. C., & Harms, P. D. (2017). Much ado about grit: A meta-analytic synthesis of the grit literature. *Journal of Personality and Social Psychology*, *113*(3), 492-511.
- Damon, W., Menon, J., & Cotton Bronk, K. (2003). The development of purpose during adolescence. *Applied Developmental Science*, *7*(3), 119-128.
- Datu, J. A. D. (2017). Sense of relatedness is linked to higher grit in a collectivist setting. *Personality and Individual Differences*, *105*, 135-138.
- Datu, J. A. D., Yuen, M., & Chen, G. (2016). Exploring determination for long-term goals in a collectivist context: A qualitative study. *Current Psychology*, 1-9.
- Davis-Kean, P. E. (2005). The influence of parent education and family income on child achievement: the indirect role of parental

- expectations and the home environment. *Journal of Family Psychology, 19*(2), 294-304.
- Dearing, E., McCartney, K., & Taylor, B. A. (2006). Within-child associations between family income and externalizing and internalizing problems. *Developmental Psychology, 42*(2), 237-252.
- De Ridder, D. T., Lensvelt-Mulders, G., Finkenauer, C., Stok, F. M., & Baumeister, R. F. (2012). Taking stock of self-control: A meta-analysis of how trait self-control relates to a wide range of behaviors. *Personality and Social Psychology Review, 16*(1), 76-99.
- Dubow, E. F., Boxer, P., & Huesmann, L. R. (2009). Long-term effects of parents education on children's educational and occupational success: Mediation by family interactions, child aggression, and teenage aspirations. *Merrill-Palmer Quarterly, 55*(3), 224-249.
- Duckworth, A.L., & Eskreis-Winkler, L., (2015). Grit. In Wright, J. D. (Eds.), *International Encyclopedia of the Social & Behavioral Sciences* (pp. 397–401). Oxford: Elsevier.
- Duckworth, A. L., & Eskreis-Winkler, L. (2013). True grit. *The Observer, 26*(4), 1-3.
- Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the Short Grit Scale (GRIT-S). *Journal of Personality Assessment, 91*(2), 166-174.

- Duckworth, A. L., Kim, B., & Tsukayama, E. (2013). Life stress impairs self-control in early adolescence. *Frontiers in Psychology, 3*, 608-619.
- Duckworth, A. L., Kirby, T. A., Tsukayama, E., Berstein, H., & Ericsson, K. A. (2011). Deliberate practice spells success: Why grittier competitors triumph at the National Spelling Bee. *Social Psychological and Personality Science, 2*(2), 174-181.
- Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: perseverance and passion for long-term goals. *Journal of Personality and Social Psychology, 92*(6), 1087-1101.
- Duckworth, A. L., Quinn, P. D., & Seligman, M. E. (2009). Positive predictors of teacher effectiveness. *The Journal of Positive Psychology, 4*(6), 540-547.
- Duckworth, A. L., Tsukayama, E., & Kirby, T. A. (2013). Is it really self-control? Examining the predictive power of the delay of gratification task. *Personality and Social Psychology Bulletin, 39*(7), 843-855.
- Duckworth, A., & Gross, J. J. (2014). Self-control and grit: Related but separable determinants of success. *Current Directions in Psychological Science, 23*(5), 319-325.

- Duckworth, A.L., Peterson, C., Matthews, M.D., Kelly, D.R., 2007. Grit: perseverance and passion for long-term goals. *Journal of Personality and Social Psychology*, 92, 1087–1101.
- Duncan, G. J., & Brooks-Gunn, J. (Eds.). (1999). Consequences of growing up poor. New York: Russell Sage Foundation.
- Duncan, G. J., Brooks-Gunn, J., & Klebanov, P. K. (1994). Economic deprivation and early childhood development. *Child Development*, 65(2), 296-318.
- Dweck, C. S. (2006). *Mindset: The new psychology of success*. New York: Random House.
- Dweck, C. S., & Elliott, E. S. (1983). Achievement motivation. *Handbook of Child Psychology*, 4, 643-691.
- Egan, M., Daly, M., Delaney, L., Boyce, C. J., & Wood, A. M. (2016). Adolescent conscientiousness predicts lower lifetime unemployment. *Journal of Applied Psychology*, 102(4), 700-709.
- Eisenberg, N., Spinrad, T. L., & Eggum, N. D. (2010). Emotion-related self-regulation and its relation to children's maladjustment. *Annual Review of Clinical Psychology*, 6, 495-525.

- Eskreis-Winkler, L., Shulman, E. P., Beal, S. A., & Duckworth, A. L. (2014). The grit effect: Predicting retention in the military, the workplace, school and marriage. *Frontiers in Psychology, 5*, 1-8.
- Gelman, S. A., Heyman, G. D., & Legare, C. H. (2007). Developmental changes in the coherence of essentialist beliefs about psychological characteristics. *Child Development, 78*(3), 757-774.
- Good, C., Aronson, J., & Inzlicht, M. (2003). Improving adolescents' standardized test performance: An intervention to reduce the effects of stereotype threat. *Journal of Applied Developmental Psychology, 24*(6), 645-662.
- Gottfredson, L. S. (1997). Why g matters: The complexity of everyday life. *Intelligence, 24*(1), 79-132.
- Guerrero, L. R., Dudovitz, R., Chung, P. J., Dosanjh, K. K., & Wong, M. D. (2016). Grit: a potential protective factor against substance use and other risk behaviors among Latino adolescents. *Academic Pediatrics, 16*(3), 275-281.
- Gunderson, E. A., Hamdan, N., Sorhagen, N. S., & D'Esterre, A. P. (2017). Who needs innate ability to succeed in math and literacy? Academic-domain-specific theories of intelligence about peers versus adults. *Developmental Psychology, 53*(6), 1188-1205.

- Haveman, R., & Wolfe, B. (1995). The determinants of children's attainments: A review of methods and findings. *Journal of Economic Literature*, 33(4), 1829-1878.
- Henderson, V. L., & Dweck, C. S. (1990). Motivation and achievement. In S. Feldman & G. Elliott (Eds.), *At the threshold: The developing adolescent*. Cambridge, MA: Harvard Press.
- Herman, W. E. (2003, August). *College student awareness of current G.P.A.* Paper presentation at Annual Meeting of the American Psychological Association, Toronto, Ontario.
- Heyman, G. D., & Giles, J. W. (2004). Valence effects in reasoning about evaluative traits. *Merrill-Palmer Quarterly*, 50(1), 86-109.
- Heyman, G. D., & Legare, C. H. (2005). Children's evaluation of sources of information about traits. *Developmental Psychology*, 41(4), 636-647.
- Jefferson, A., Bortolotti, L., & Kuzmanovic, B. (2017). What is unrealistic optimism?. *Consciousness and Cognition*, 50, 3-11.
- Kim, E., & Yang, M. (2013). The influence of emotional regulation on academic achievement through academic emotions and learning strategies. *The Korean Journal of School Psychology*, 10(1), 201-218.

- Kim, J., & Park, D. (2017). The longitudinal effects of theory of implicit intelligence on academic achievement: The mediating effect of grit. *The Korean Journal of Educational Psychology, 31*(1), 145-162.
- Kim, Y., & Kwak, K. (2011). Relationship between unrealistically optimistic beliefs in early childhood and intelligence in middle childhood. *The Korean Journal of Developmental Psychology, 24*(1), 79-92.
- Kim, Y., & Kwak, K. (2014). The longitudinal relationship between infants' responding to joint attention and preschoolers' delays in gratification. *The Korean Journal of Human Development, 21*(4), 61-75.
- Kim, Y., & Kwak, K. (2015). Relationship among children's unrealistically optimistic beliefs, intelligence and delay of gratification in preschool age. *The Korean Journal of Developmental Psychology, 28*(4), 71-85.
- Kirkcaldy, B., Furnham, A., & Siefen, G. (2004). The relationship between health efficacy, educational attainment, and well-being among 30 nations. *European Psychologist, 9*(2), 107-119.
- Klebanov, P. K., Brooks-Gunn, J., & Duncan, G. J. (1994). Does neighborhood and family poverty affect mothers' parenting, mental

health, and social support?. *Journal of Marriage and the Family*, 56(2), 441-455.

Kuncel, N. R., Credé, M., & Thomas, L. L. (2005). The validity of self-reported grade point averages, class ranks, and test scores: A meta-analysis and review of the literature. *Review of Educational Research*, 75(1), 63-82.

LeBreton, J. M., Wu, J., & Bing, M. N. (2009). The truth(s) on testing for mediation in the social and organizational sciences. In C.E. Lance & R. J. Vandenberg (Eds.), *Statistical and Methodological Myths and Urban Legends*, (pp. 109-144). New York: Routledge.

Lee, S. (2015). *Effects of grit, deliberate practice and contingencies of self-worth on academic achievement* (Unpublished doctoral dissertation). Yonsei University, Seoul, Republic of Korea.

Lee, S., Bae, E. Sohn, Y. W. & Lee, S. (2016). Grit as a buffer against negative feedback: The effect of grit on emotional responses to negative feedback. *The Korean Journal of Social and Personality Psychology*, 30(3), 25-45.

Lee, S. R., & Sohn, Y. W. (2013). What are the strong predictors of academic achievement? – Deliberate practice and Grit. *The Korean Journal of School Psychology*, 10(3), 349-366.

- Leonard, J. A., Lee, Y., & Schulz, L. E. (2017). Infants make more attempts to achieve a goal when they see adults persist. *Science*, *357*(6357), 1290-1294.
- Lim, H. J. (2017). An exploratory study on grit's factor structure and its validity. *Asian Journal Education*, *18*(2), 169-192.
- Lim, M. H., & Park, Y. S. (2006). A study of happiness among Korean adolescents: With specific focusing on elementary and middle school students. *Journal of Education and Culture*, *12*, 159-179.
- Lockhart, K. L., Chang, B., & Story, T. (2002). Young children's beliefs about the stability of traits: protective optimism? *Child Development*, *73*(5), 1408-1430.
- Lockhart, K. L., Goddu, M. K., & Keil, F. C. (2017). Overoptimism about future knowledge: Early arrogance?. *The Journal of Positive Psychology*, *12*(1), 36-46.
- Malin, H., Liauw, I., & Damon, W. (2017). Purpose and character development in early adolescence. *Journal of Youth and Adolescence*, *46*(6), 1200-1215.
- Martel, M. M., Nigg, J. T., Wong, M. M., Fitzgerald, H. E., Jester, J. M., Puttler, L. I., et al. (2007). Childhood and adolescent resiliency, regulation, and executive functioning in relation to adolescent

- problems and competence in a high-risk sample. *Development and Psychopathology*, *19*, 541-563.
- Mischel, W., & Baker, N. (1975). Cognitive appraisals and transformations in delay behavior. *Journal of Personality and Social Psychology*, *31*(2), 254-261.
- Mischel, W., Ebbesen, E. B., & Zeiss, A. R. (1972). Cognitive and attentional mechanisms in delay of gratification. *Journal of Personality and Social Psychology*, *21*(2), 204–218.
- Mischel, W., Shoda, Y., & Peake, P. K. (1988). The nature of adolescent competencies predicted by preschool delay of gratification. *Journal of Personality and Social Psychology*, *54*(4), 687.
- Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., ... & Sears, M. R. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences*, *108*(7), 2693-2698.
- Muenks, K., Wigfield, A., Yang, J. S., & O'Neal, C. R. (2017). How true is grit? Assessing its relations to high school and college students' personality characteristics, self-regulation, engagement, and achievement. *Journal of Educational Psychology*, *109*(5), 599-620.
- Myers, C. A., Wang, C., Black, J. M., Bugescu, N., & Hoefft, F. (2016). The matter of motivation: Striatal resting-state connectivity is

dissociable between grit and growth mindset. *Social Cognitive and Affective Neuroscience*, 11(10), 1521-1527.

Nagin, D. S., & Tremblay, R. E. (2001). Parental and early childhood predictors of persistent physical aggression in boys from kindergarten to high school. *Archives of General Psychiatry*, 58(4), 389-394.

O'Rourke E., Haimovitz K., Ballweber C., Dweck C., Popovi Z. (2014). Brain points: a growth mindset incentive structure boosts persistence in an educational game, in *Paper Presented at the Proceedings of the 32nd Annual ACM Conference on Human Factors in Computing Systems* (Toronto, ON)

Oettingen, G., & Wadden, T. A. (1991). Expectation, fantasy, and weight loss: Is the impact of positive thinking always positive?. *Cognitive Therapy and Research*, 15(2), 167-175.

Park, D., Gunderson, E. A., Tsukayama, E., Levine, S. C., & Beilock, S. L. (2016). Young children's motivational frameworks and math achievement: Relation to teacher-reported instructional practices, but not teacher theory of intelligence. *Journal of Educational Psychology*, 108(3), 300-313.

Peake, P. K. (2017). Delay of gratification: Explorations of how and why children wait and its Linkages to Outcomes Over the Life Course.

In Stevens, J. R (Eds.), *Impulsivity* (pp. 7-60). New York: Springer International Publishing.

Raaijmakers, M. A., Smidts, D. P., Sergeant, J. A., Maassen, G. H., Posthumus, J. A., Van Engeland, H., & Matthys, W. (2008). Executive functions in preschool children with aggressive behavior: Impairments in inhibitory control. *Journal of Abnormal Child Psychology*, *36*(7), 1097.

Rana, R. A., & Mahmood, N. (2010). The relationship between test anxiety and academic achievement. *Bulletin Education and Research*, *32*, 63-74.

Rattan, A., Savani, K., Chugh, D., & Dweck, C. S. (2015). Leveraging mindsets to promote academic achievement: Policy recommendations. *Perspectives on Psychological Science*, *10*(6), 721-726.

Robertson-Kraft, C., & Duckworth, A. L. (2014). True grit: Trait-level perseverance and passion for long-term goals predicts effectiveness and retention among novice teachers. *Teachers College record* (1970), *116*(3), 1-24.

- Salles, A. Cohen, G. L., & Mueller, C. M. (2014). The relationship between grit and resident well-being. *The American Journal of Surgery*, *207*, 251-254.
- Schlam, T. R., Wilson, N. L., Shoda, Y., Mischel, W., & Ayduk, O. (2013). Preschoolers' delay of gratification predicts their body mass 30 years later. *The Journal of Pediatrics*, *162*(1), 90-93.
- Schlechter, M., & Milevsky, A. (2010). Parental level of education: associations with psychological well-being, academic achievement and reasons for pursuing higher education in adolescence. *Educational Psychology*, *30*(1), 1-10.
- Schunk, D. H. , Pintrich P. R., & Meece, J. L. (2008). *Motivation in education: Theory, research, and applications* (3rd Ed.). Upper Saddle River, NJ: Merrill & Prentice Hall.
- Shoda, Y., Mischel, W., & Peake, P. K. (1990). Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification: Identifying diagnostic conditions. *Developmental Psychology*, *26*(6), 978-986.
- Singh, K., & Jha, S. D. (2008). Positive and negative affect, and grit as predictors of happiness and life satisfaction. *Journal of the Indian Academy of Applied Psychology*, *34*(2), 40-45.

- Steelandt, S., Thierry, B., Broihanne, M. H., & Dufour, V. (2012). The ability of children to delay gratification in an exchange task. *Cognition, 122*(3), 416-425.
- Strayhorn, T. L. (2014). What role does grit play in the academic success of black male collegians at predominantly white institutions?. *Journal of African American Studies, 18*(1), 1-10.
- Suldo, S. M., Riley, K., and Shaffer, E. J. (2006). Academic correlates of children and adolescents' life satisfaction. *School Psychology International, 27*, 567-582.
- Suldo, S. M., Shaffer, E. J., & Riley, K. N. (2008). A social-cognitive-behavioral model of academic predictors of adolescents' life satisfaction. *School Psychology Quarterly, 23*(1), 56-69.
- Suldo, S., Thalji, A., & Ferron, J. (2011). Longitudinal academic outcomes predicted by early adolescents' subjective well-being, psychopathology, and mental health status yielded from a dual factor model. *The Journal of Positive Psychology, 6*(1), 17-30.
- Tamis-LeMonda, C. S., Shannon, J. D., Cabrera, N. J., & Lamb, M. E. (2004). Fathers and mothers at play with their 2-and 3-year-olds: contributions to language and cognitive development. *Child Development, 75*(6), 1806-1820.

- Tetzner, J., & Becker, M. (2017). Think Positive? Examining the Impact of Optimism on Academic Achievement in Early Adolescents. *Journal of Personality*, 1-13.
- Thomas, A. J., & Sarnecka, B. W. (2015). Exploring the relation between people's theories of intelligence and beliefs about brain development. *Frontiers in Psychology*, 6, 1-12.
- Vainio, M. M., & Daukantaitė, D. (2016). Grit and different aspects of well-being: Direct and indirect relationships via sense of coherence and authenticity. *Journal of Happiness Studies*, 17(5), 2119-2147.
- Vohs, K. D., & Faber, R. J. (2007). Spent resources: Self-regulatory resource availability affects impulse buying. *Journal of Consumer Research*, 33(4), 537-547.
- Wagerman, S. A., & Funder, D. C. (2006). Acquaintance reports of personality and academic achievement: A case for conscientiousness. *Journal of Research in Personality*, 41(1), 221-229.
- West, M. R., Kraft, M. A., Finn, A. S., Martin, R. E., Duckworth, A. L., Gabrieli, C. F., & Gabrieli, J. D. (2016). Promise and paradox: Measuring students' non-cognitive skills and the impact of schooling. *Educational Evaluation and Policy Analysis*, 38(1), 148-170.

- Wolters, C. A., & Hussain, M. (2015). Investigating grit and its relations with college students' self-regulated learning and academic achievement. *Metacognition and Learning, 10*(3), 293-311.
- Zeytinoglu, S., Calkins, S. D., Swingler, M. M., & Leerkes, E. M. (2017). Pathways from maternal effortful control to child self-regulation: The role of maternal emotional support. *Journal of Family Psychology, 31*(2), 170.

Appendix

Appendix 1. 학업 성취 척도

Appendix 2. 지능에 대한 암묵적 신념 척도 (Implicit Theories of Intelligence Scale)

Appendix 3. 그릿 척도 (Grit Scale)

Appendix 4. 부모 학력(Parental Education Level)

Appendix 1. 학업 성취 척도

가장 최근의 기말고사 성적은 어땠는지 표시해 주세요.

		낮은 편이다		보통 이다		높은 편이다
1	국어	1	2	3	4	5
2	영어	1	2	3	4	5
3	수학	1	2	3	4	5

Appendix 2. 지능에 대한 암묵적 신념 척도 (Implicit Theories of Intelligence Scale)

다음을 읽고 자신의 생각이나 모습과 일치하는 정도를 골라 표시해 주세요.

		전혀 그렇지 않다	그렇지 않다	약간 그렇지 않다	약간 그렇다	그렇다	매우 그렇다
1	지능은 어느 정도 결정되어 있어 바꾸기 어렵다	1	2	3	4	5	6
2	지능은 타고나는 거라 변화시키기 어렵다	1	2	3	4	5	6
3	새로운 것을 배울 수는 있지만 그것으로 타고난 지능을 바꾸기는 어렵다	1	2	3	4	5	6
4	타고난 지능이 어떻든지 나는 내 지능을 변화시킬 수 있다	1	2	3	4	5	6
5	나는 내 지능을 많이 변화시킬 수 있다	1	2	3	4	5	6
6	내가 가진 지능의 정도와 관계없이 나는 언제든지 지능을 변화시킬 수 있다	1	2	3	4	5	6

Appendix 3. 그릿 척도 (Grit Scale)

♣ 다음을 잘 읽고 각 문항에 대해서 자신과 얼마나 비슷한지를 표시해 주세요.

		전혀 그렇지 않다	그렇지 않다	보통 이다	그렇다	매우 그렇다
1	나는 종종 목표를 세우지만, 나중에 그것과는 다른 일을 하곤 한다	1	2	3	4	5
2	나는 부지런하다	1	2	3	4	5
3	나의 관심사는 매년 바뀐다	1	2	3	4	5
4	좌절은 나의 의욕을 꺾지 못한다	1	2	3	4	5
5	나는 몇 개월마다 새로운 목표나 관심사에 흥미를 갖게 된다	1	2	3	4	5
6	나는 수년의 노력을 요구하는 목표를 달성해 본 적이 있다	1	2	3	4	5
7	때때로 새로운 생각이나 일 때문에 기존에 하고 있는 생각이나 일이 방해 받는다	1	2	3	4	5
8	나는 내가 시작한 것은 무엇이든 끝낸다	1	2	3	4	5
9	나는 열심히 하는 사람이다	1	2	3	4	5
10	나는 한동안 새로운 생각이나 계획에 사로잡히지만 곧 관심을 잃게 된다	1	2	3	4	5
11	나는 중요한 도전을 위해 좌절을 극복해 왔다	1	2	3	4	5
12	나는 달성하는데 몇 개월이 걸리는 일에 꾸준히 집중하기 어렵다	1	2	3	4	5

Appendix 4. 부모 학력(Parental Education Level)

♣ 귀하의 최종 학력을 알려주십시오.

- ① 중학교 졸업 ② 고등학교 졸업 ③ 전문대학교 졸업
 ④ 대학교 졸업 ⑤ 대학원 졸업

국문초록

많은 선행 연구들이 성공의 예측 요인에 대해 연구해왔다. 그중 하나는 그릿으로 이는 장기적 목표에 대한 인내와 열정을 의미한다 (Duckworth, Peterson, Matthews, & Kelly, 2007, p. 1087). 지난 10 년간 그릿에 관한 연구가 활발히 이루어졌음에도 불구하고, 동양권에서의 연구는 상대적으로 부족한 실정이며 대부분의 연구들은 대학생을 대상으로 이루어져왔다. 더불어 많은 선행 연구들이 그릿의 효과만을 중심으로 연구하였으며 그릿의 예측 요인을 탐색한 연구는 전무하다. 따라서 본 연구에서는 한국 청소년들을 대상으로 그릿 연구를 진행하였고 아울러 종단적인 관점에서 그릿의 전조 변인을 탐색하였다.

현 연구에는 106 명의 한국 청소년들이 참여하였다. 먼저 연구 1 에서는 지능에 대한 암묵적 신념, 학업 성취, 그리고 그릿 간의 관련성을 알아보았다. 모든 변인은 참여자의 자가 보고를 통해 측정되었다. 연구 결과, 개인의 지능에 대한 암묵적 신념과 그릿은 학업 성취와 관련이 있는 것으로 나타났다. 또한, 지능에 대한 암묵적

신념은 그릿과 관련이 있는 것으로 나타났다. 아울러 그릿이 지능에 대한 암묵적 신념과 학업 성취 간의 관계를 완전 매개하는 것으로 나타났다.

연구 2에서는 10년간의 종단 연구를 통해 청소년기 그릿의 전조가 되는 변인을 탐색하였다. 참여자가 만 4 세일 때 부모의 학력, 환상적인 낙관적 믿음, 만족 지연을 측정하였다. 부모의 학력은 참여자의 부모가 직접 보고하였다. 환상적인 낙관적 믿음은 개인이 자신의 능력이나 미래에 대해 과대 평가하는 인지적 편향으로 현 연구에서는 최선영, 곽금주(2007)에서 사용된 방법을 사용하여 부정적 형질의 긍정적 변화와 긍정적 형질의 유지 조건을 모두 측정하였다. 아울러 만족 지연은 Mischel 과 Baker(1975)가 개발한 만족 지연 과제를 사용하여 아동이 눈앞에 있는 간식을 먹지 않고 이후의 더 큰 보상을 위해 만족을 지연하는 시간을 측정하였다. 추가적으로, 참여자가 만 14 세가 되었을 때 그릿을 자가 보고로 측정하였다. 단계적 회귀 분석을 사용한 결과, 만족 지연이 청소년기 그릿의 예측 요인으로 작용하는 것으로 나타났다. 그릿의 두 요소를 나누어 분석한 결과, 만족 지연은 노력의 꾸준함을 예측하였지만, 관심의 일관성은 예측하지 않았다.

현 연구는 한국 청소년의 그릇에 대해 심층적으로 연구하였다는 점에서 중요하다고 할 수 있다. 현 연구 결과는 만족 지연을 잘 하지 못하는 아동들에게 조기 개입하여 이들이 청소년이 되었을 때 낮은 그릇을 갖지 않도록 예방할 수 있는 가능성을 열어주었다. 이 연구는 발달심리학 관점에서 그릇의 전조 변인에 대해 종단적으로 알아본 첫번째 실증연구라는 것에 학문적 의의가 있다. 아울러 논의에서는 연구의 활용과 추후 연구 방향에 대해 제언하였다.

주요어: 그릇, 만족 지연, 청소년기, 아동 초기, 지능에 대한 암묵적 신념, 종단 연구

학번: 2016-20190