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Abstract

Mental toughness (MT) has been related to high performance in competitive situations. The current studies tested whether individual differences in MT were associated with success in two achievement domains: higher education and work. Academic performance and attendance were assessed over three years in a British university sample. MT was associated with higher average academic grades (Study 1). Individual differences in MT predicted individuals' income, controlling for age and gender (Study 2). The results suggest that MT entails positive psychological resources that are important for academic and career success. Future research aiming at exploring the factors that contribute to variation in MT and the mechanisms that underlie the association between MT and achievement may have significant implications for predicting and optimizing performance in various domains.

Keywords: mental toughness, academic performance, career success, achievement

Individual Differences in Mental Toughness Associate with Academic Performance and Income

There is an increasing amount of evidence showing that personality traits associate with positive outcomes in achievement domains, such as education (Chamorro-Premuzic & Furnham, 2003; Poropat, 2009) and work (Barrick & Mount, 1991). In educational contexts, for example, personality traits have been associated with academic grades, attendance, and peer relationship (Chamorro-Premuzic & Furnham, 2003; Poropat, 2009; St Clair-Thompson et al., 2014). Research indicates that while individual differences in cognitive traits, such as intelligence, are associated with academic performance and learning; individual differences in personality traits may facilitate the use of these cognitive traits contributing indirectly to individual variation in learning (Rindermann & Neubauer, 2001).

The relationship between non-cognitive traits and performance may vary at different phases of life. For example, in educational contexts, personality traits may be stronger predictors of academic performance in higher education in comparison to lower levels of education. Aspects of post-secondary education can be distinct from elementary and secondary education (O'Connor & Paunonen, 2007). For instance, university samples tend to exhibit less individual variation in intellectual ability as a result of students being selected on the basis of similar academic performance at high school (Furnham, Chamorro-Premuzic, & McDougall, 2002). Indeed, the predictive value of cognitive ability for academic performance decreases at higher level of education as compared to lower levels of education (Furnham et al., 2002; O'Connor & Paunonen, 2007). As such, during post-secondary education, non-cognitive individual differences may become increasingly important during high-stake testing (Ackerman, Bowen, Beier & Kanfer, 2001).

Mental Toughness

A personality construct that has grown in popularity in the last decade and has been explored in relation to mental health, organizational and educational outcomes is Mental Toughness (MT) (e.g. Marchant et al., 2009; St Clair-Thompson et al., 2014; Stamp et al., 2015). MT is defined as a multidimensional personality construct, which allows one to remain relatively unaffected by stressors and to strive in challenging situations (Clough, Earle, & Sewell, 2002; Jones & Moorhouse, 2007). It covers a set of positive psychological resources that influence how an individual evaluates and responds to demanding events to consistently achieve his or her goals (Gucciardi, Gordon, & Dimmock, 2009).

The most frequently applied conceptualization of MT is the 4C's model developed by Clough, Earle, and Sewell (2002). The 4C's model defines MT in terms of four factors: (1) *Commitment*: the tendency to be involved in pursuing goals despite problems that arise, (2) *Challenge*: the tendency to perceive changes as opportunities of self-development rather than threats to security, (3) *Control* (life and emotion control): the tendency to feel and act as if one is in control of and able to exert influence on the environment, while keeping anxieties in check, and (4) *Confidence* (ability and interpersonal): the tendency to believe in one's ability to successfully complete tasks and push themselves forward in social settings. Mentally tough individuals, as described by Clough et al. (2002), tend to remain calm, competitive and confident in the face of adversity or challenge. They have lower anxiety levels than others and firmly believe that they control their own destiny.

Mental Toughness and Achievement

The idea that MT is vital for high achievement is rooted in its empirical and theoretical associations with established predictors of achievement outcomes. The Big Five personality factors have been used extensively to predict achievement across a wide range of domains (Barrick & Mount, 1991; Chamorro-Premuzic & Furnham, 2003; Poropat, 2009). A

meta-analysis, with a cumulative sample size of over 70,000 participants, suggests that conscientiousness is a robust predictor of academic performance across academic levels, and that its effect is mostly independent of intelligence (Poropat, 2009). Longitudinal evidence has also suggested that neuroticism predicts negatively academic grades, especially during exams (Chamorro-Premuzic & Furnham, 2003). Similarly, conscientiousness and neuroticism (negatively) have been consistently related to work outcomes including job performance, leadership, and career success (Barrick & Mount, 1991; Judge, Higgins, Thoresen, & Barrick, 1999; Judge, Bono, Ilies, & Gerhardt, 2002). A behavioral genetic study has shown that MT is related to conscientiousness and neuroticism at the phenotypic, genetic and environmental levels (Horsburgh, Schermer, Veselka, & Vernon, 2009).

MT is also conceptually related to the concept of self-efficacy in its core emphasis on self-belief (Madrigal, Hamill, & Gill, 2013). Self-efficacy is a significant determinant of educational performance and adjustment (Chemers, Hu, & Garcia, 2001), academic motivation (McGeown et al., 2014) and work performance in organizational settings (McDonald & Siegall, 1992; Stajkovic & Luthans, 1998). The challenge and control subscale of MT also overlap with resilience, which is the capacity to adapt effectively in a disadvantaged or stressful environment (Egeland, Carlson, & Sroufe, 1993). Resilience is an important correlate of academic attainment, especially in the face of academic adversity (Martin, 2013; Putwain, Nicholson, Connors, & Woods, 2013).

MT may also influence achievement outcomes indirectly by reducing stress levels. Stress impacts cognitive functioning adversely (Arnsten, 2009) and impairs one's ability to perform well academically (Felsten & Wilcox, 1992). In response to a self-select stressor, mentally tough individuals reported more problem-focused coping strategies and fewer emotional focused or avoidance strategies (Kaiseler et al., 2009). Problem-focused coping

was associated with greater coping effectiveness. In addition, MT has been related to learned resourcefulness, which is a repertoire of acquired abilities that promote emotional control and stress management (Cowden, Fuller, & Anshel, 2014). Learned resourcefulness has been found to moderate significantly the relationship between academic stress and academic performance (Akgun & Ciarrochi, 2003). Indeed, in a longitudinal study by Gerber, Brand et al. (2013), well-adjusted students, who consistently had lower levels of stress, fewer depressive symptoms and higher life satisfaction, reported high levels of MT. A positive association has also been shown between MT and psychological wellbeing among undergraduate students (Stamp et al., 2015). As such, individuals with higher levels of MT might perform better in domains that involve stress and challenges, in comparison to cognitive ability-matched peers with lower levels of MT.

The aforementioned evidence suggests that MT may be a vital resource that fosters coping effectiveness and successful adaptation in the face of challenges and setbacks that arise in life. As such, it should be highly relevant to achievement in demanding contexts. Indeed, MT literature has documented associations between MT and positive outcomes in educational and organizational contexts. A set of studies by St Clair-Thompson et al. (2014) explored the relationship between MT and school performance among adolescents. Using the 4C's model, it was shown that total MT and the scales of challenge, commitment and control were positively correlated with academic attainment and attendance. Low levels of control of life appeared to be predictive of counterproductive classroom behavior, whereas confidence in abilities and interpersonal confidence were associated with peer relationships (St Clair-Thompson et al., 2014).

To date there is only one study that has explored the degree to which MT associates with academic grades and progression in higher education. Crust and colleagues (2014)

reported significant and positive correlations between total MT, grades, and progression in university sports students. The authors suggested that future studies could explore attendance in relation to MT and that more longitudinal research is needed to track student progress and achievement over the standard three-year duration of undergraduate study (Crust et al., 2014).

The significance of MT in performance is not limited to education, but also extends to the workplace. A recent study by Gucciardi, Hanton et al. (2015) showed that MT was directly related to higher levels of supervisor-rated work performance in a sample of 497 employees in Australia. Perceived stress partially mediated the relationship between mental toughness and work performance. Individuals' level of MT can also play a significant role in career advancement. Marchant et al. (2009) investigated the relationship between mental toughness and managerial positions in a sample of 522 participants working in UK-based organizations. Higher levels of MT were associated with more senior managerial positions and tended to increase with age. Taken together, these findings suggest that individuals with higher levels of mental toughness are likely to achieve more favorable outcomes at work.

The Current Research

The purpose of the current research was to investigate the associations between MT and academic and career success. We expected individual variation in MT to be associated with objective measures of academic and career attainment. To this end, academic attainment was assessed using academic grades over the entire course of tertiary education (Study 1). Objective career success was operationalized as personal annual income (Study 2). Career success can be considered in terms of subjective (intrinsic) and objective (extrinsic) achievements as a result of work experiences (Seibert, Crant, & Kraimer, 1999). While subjective career success is commonly operationalized as self-reported career or job satisfaction, indicators of objective career success include income, promotion and

occupational status (Judge et al., 1995; Judge, Higgins, Thoresen, & Barrick, 1999).

Specially, income is a robust predictor of career satisfaction and other subjective evaluation of success (Judge et al., 1995; Raabe, Frese, & Beehr, 2007). In two studies we tested the following hypotheses:

- (1) MT will be positively associated with university students' grades and attendance (Study 1);
- (2) MT will be positive associated with individual's job income (Study 2).

Study 1

In the first study we explored the associations between MT and academic grades and attendance in a sample of British university students. We hypothesized that total MT would be positively correlated with academic grades and attendance over the three-year period of tertiary education.

Method

Participants. The participants were 49 final-year Psychology undergraduates (6 males, 42 females) from a university in United Kingdom. Four participants were excluded from the sample because of incomplete academic records. The final sample included 45 participants (6 males, 38 females). Participants' age ranged from 21 to 36 years (mean age 21 years and 3 months). Students were from mixed cultural backgrounds, with 73.3% from Europe and 26.7% from the rest of the world.

Measures and Procedures. Participants were asked to complete the MTQ48 (Clough, Earle, & Sewell, 2002) and to provide demographic data (age, sex, nationality and first language). The MTQ48 consists of 48 items, which provide a total MT score and scores for the 4 subscales: commitment, control (life and emotion), confidence (interpersonal and ability), and challenge. Examples of items are "I generally fell in control" and "challenges

usually bring out the best in me". Participants rated the extent to which they agreed with each statement on a 5-point Likert scale from 1 (Strongly disagree) to 5 (Strongly agree). An overall MT score can be calculated by averaging scores of all 48 items of the questionnaire. Participants were also asked to provide demographic information, including information on age, gender, nationality, and first language.

Participants' academic grades (average results per year and the total average grade over the three years were derived from marks on academic essays, critical reviews, written exams, multiple choice questions and final year research projects) and attendance records of core modules were obtained from the university's Students' Records and Data Office. The Psychology degree at the university is accredited by the British Psychological Society. Therefore, the course's structure is comparable to undergraduate psychology programs offered by other universities in the United Kingdom.

Results

Descriptive Statistics. Descriptive statistics and Cronbach's alphas for total MT and the four scales (challenge, commitment, control, and confidence) as well as the measures of academic performance and attendance are presented in Table 1. Table 1 also presents the ~~Table 1 also provides descriptive statistics for the measures of academic performance and attendance.~~

~~Table S1 in the supplementary material presents the~~ associations between average academic grades at year 1 with average academic grades at year 2 and 3 and total average academic grades (average of year 1, 2 and 3), as well as the associations between academic grades (year 1, 2, 3 and total) and attendance. ~~Average grade at year 1 were strongly associated with average grade at year 2 and 3; and average grade at year 2 were strongly associated with average grade at year 3.~~ Given the strong correlations between grades from

year 1 to year 3 and in order to avoid running a large number of correlations, which increases the likelihood of Type 1 error, we explored the association of MT and its four scales with total average grade only.

The demographic variables of gender, age and ethnicity did not correlate significantly with academic performance ~~and~~, attendance ~~and~~ MT. Therefore, we did not include them as covariates in the main analysis.

Table 1 should be placed here

Association between Mental Toughness, Total Average Grade and Attendance.

Pearson correlations between total average grade, MT and the four scales are presented in Table ~~12~~. Total average grade significantly correlated with total MT, ($r = .31, p < .05$), and the scales of commitment ($r = .34, p < .05$), and control, ($r = .34, p < .05$). No significant association was found between attendance and MT and the four scales of MT ($p > .05$).

Table ~~12~~ should be placed here

We ran a multiple linear regression to explore the amount of variance of total average grade that could be explained by both the scales of commitment and control (MT scales that correlated significantly with total average grades). Commitment and control together accounted for 16.5% of the variance in total average grade, $F(2,42) = 4.14$, $\text{cohen's } f^2 = .20$, $p < .05$.

Study 2

Study 1 established an association between MT and academic attainment in higher education. The purpose of Study 2 was to explore the degree to which individual differences in MT are associated with job income, a marker of objective career success, in a sample of working participants. In addition, we expected levels of MT to increase with age, as shown in the study by Marchant et al. (2009). The notion that MT increases with age has important

implications, as it suggests that MT can be developed over time with increasing life experiences, which in turn contributes to career advancement.

Method

Participants. The sample consisted of 100 participants (37 males, 63 females) who had a full-time job at the time of testing. Participants were recruited through advertisements on social networks and word of mouth. The mean age was 32.03 years ($SD = 8.99$; range 18 – 62). The sample included participants of mixed ethnic backgrounds, with White European/Americans (44%) and Asian (34%) forming the two largest ethnic groups. While the majority of the participants (70%) worked in the United Kingdom, 26% worked in Asia, 2% in the rest of the Europe, and 2% in North America at the time of testing. Participants did not receive any payment for their participation in the study.

Measures and Procedure. Participants were invited to participate in the study. After they agreed to take part, they completed the questionnaires either on paper or online. Participants were asked to complete the MTQ48 (Clough, Earle, Sewell, 2002) as described in Study 1. They were then asked to report their current annual income by choosing from seven categories, starting from “less than 15,000 pounds” to “80,000 pounds and above. Based on the reported levels of income, participants’ annual income was classified into 4 ordinal categories: high income (£35,001 and above, $n = 25$), medium-high income (£25,001 - £35,000, $n = 25$), low-medium income (£15,001 - £25,000, $n=20$) and low income (£15,000 and below, $n = 30$). Participants were also asked for demographic information including age, gender, ethnicity, education and work location. Age and gender were the only demographic variable that associated significantly with both MT and income.

Results

Table 24 presents the descriptive statistics and Cronbach’s alphas for total MT and the

four scales.

Table 24 should be placed here

We used Spearman rank correlation coefficients to examine the extent to which participants' income level was correlated with MT as well as the four MT scales (Table 2). The analysis revealed that income level was correlated positively and significantly with MT ($r_s = .36, p < .001$) and the scales of challenge ($r_s = .26, p < .05$), commitment ($r_s = .30, p < .001$), control ($r_s = .32, p < .001$), and confidence ($r_s = .32, p < .001$). Figure 1 presents the mean MT score at each income level. Figure 1S – 4S in supplementary materials present the mean score of each subscale at each income level.

Figure 1 should be placed here

Demographic variables including age, gender (male, female), education (dummy coded as high school degree and below, Bachelor's degree, Master's degree and above), and work location (developing, developed country) were considered as potential predictors of income level. We ran an ordinal regression using the aforementioned demographic variables as predictor variables and income level as the outcome variable. Results were presented in Table S12 in the Supplementary materials. The main effects of age and gender were significant, explaining a moderate proportion of the variance in income (Cox and Snell's $R^2 = 26.8%$, $chi-square = 31.18, df = 2, p < .001$). Older individuals tended to have greater income than young individuals ($\chi^2 = 24.36, df = 1, p < .001$). Men were more likely to achieve higher income than women ($\chi^2 = 5.33, df = 1, p < .05$).

We investigated the effect of ~~total~~ MT on individuals' income level, while controlling for age and gender. ~~Table 34~~ is a summary of results of ~~the two hierarchical~~ ordinal regression analyses ~~is using with~~ age, gender ~~and in the first block and either~~ total MT or MT subscales as predictor variables in the second block. No significant second-order interaction

was found. Only main effects were considered in the final model. This was because the difference in the likelihood ratio for the model with age, gender and total MT main effects and all two-way interactions versus that for the model with main effects only was .015 (df = 6).

Table 34 should be placed here

When regressing income on age, gender and total MT, the effect of age on income remained significant ($\chi^2 = 19.54$, $df = 1$, $p < .001$), whereas the effect of gender was only marginally significant ($\chi^2 = 3.11$, $df = 1$, $p = .08$). Participants with higher levels of total MT achieved higher income levels, when age and gender were controlled for. A final ordinal regression model with total MT and age as predictor variables explained a moderate proportion of the variance in individuals' income (Cox and Snell's $R^2 = 31.4\%$, *chi-square* = 33.70, $df = 2$, $p < .001$). A similar effect was found when only participants working in the UK were included (see Table S23 in the supplementary materials).

The effect of MT on income was broken down by examining the individual effects of the four MT subscales, namely, challenge, commitment, control and confidence (Table 3). ~~Table 5 presents the results of ordinal regression analysis with~~ When regressing income on age, gender, challenge, commitment, control and confidence as predictor variables, ~~Control was the only MT scale that was a significant predictor of individual income~~ ($\chi^2 = 4.35$, $df = 1$, $p < .05$).

Table 5 should be placed here

We found a significant effect of age on MT in a series of regression analyses with age as predictor variable and MT and the four MT scales as dependent variables. Increased age was a significant predictor of greater total MT ($\beta = .28$, $t(99) = 2.91$, $p < .01$, $R^2 = 7.9\%$) and the scales of commitment ($\beta = .32$, $t(99) = 3.36$, $p < .01$, $R^2 = 10.3\%$) and confidence ($\beta =$

.25, $t(99) = 2.59$, $p < .05$, $R^2 = 6.4\%$). Age did not have a significant effect on the scales of control or challenge, $p > .05$.

Discussion

The aim of the present studies was to explore the degree to which individual differences in MT associate with academic attainment and attendance over three years of university (Study 1) and differences in individuals' job income, an objective measure of career success (Study 2). In Study 1, we found that MT was positively associated with longitudinal academic grades during tertiary education. In Study 2, mentally tougher individuals achieved higher income than less mentally tough individuals of same age and gender. In addition, we found that MT increases with age, suggesting that at least some aspects of MT may be developed with increased exposure to life events.

Previous research on the association between MT and academic outcomes suggests that longitudinal research is needed to track student achievement over the standard three-year duration of undergraduate study (Crust et al., 2014). The findings of the current study have extended previous findings in this area of research, demonstrating that MT and its subscales are important correlates of positive academic outcomes in higher education. Specifically, Study 1 showed that total MT explained approximately 9% of the variance in a measure of total academic performance, derived by marks achieved over the course of a three-year university degree in Psychology. Furthermore, the scales of commitment and control explained 16.5% of the variation in total academic performance. As such, control and commitment were the strongest MT predictors of academic performance. Therefore, interventions targeting control and commitment are most likely to benefit academic performance in the higher education.

The positive association between MT and academic performance may be explained by previous findings, which suggest that mentally tough individuals tend to demonstrate more problem-focused coping strategies and to cope with stress more effectively (Kaiseler et al., 2009). High levels of MT may promote students' resilience in the face of adversities preventing stressors from impairing academic outcomes. Individual differences in MT did not correlate with attendance in the current research. However, attendance was a significant correlate of academic performance. It should be noted that the non-significant correlation between attendance and MT may occur due to ceiling effect, as the amount of variation for the measure of attendance was low. This was because all students had to attend on at least a certain percentage of classes in order to be able to continue with their studies.

Individual variation in MT, and specifically the scale of control associated positively with individuals' income. This finding provides support to the relevance of MT in organizational settings. It aligns closely with previous research which demonstrated that greater MT was related to better work performance (Gucciardi, Hanton et al., 2015) and more senior managerial positions (Marchant et al., 2009). However, due to the cross-sectional nature of the study, we cannot dismiss the alternative explanation that people with higher income may feel more satisfied and engaged with their job (Judge et al., 2010), and in turn lead to increased level of MT through the work process. Indeed, prior longitudinal research has shown a reciprocal relationship between personality traits and objective career success. Earning a higher income, for instance, decreased neuroticism across a ten-year period (Sutin, Costa, Miech, & Eaton, 2009). Similar relationship may exist between career success and aspects of MT. Longitudinal research is needed to provide a more comprehensive understanding of the relationship between MT and career success.

We found a positive relationship between age and MT, and more specifically the subscales of commitment and confidence. This finding has important theoretical and applied implications suggesting that mental toughness is, at least to some degree, malleable and shaped by life experiences. Theoretically, this finding sheds light on the debate of mental toughness as a dispositional trait or an adaptable state. While some researchers propose that mental toughness is a stable dispositional trait (e.g. Clough et al., 2002), some argue that it is a mindset that varies across situations and over time (e.g. Harmison, 2011). The finding that levels of MT increased with age suggests that MT is sensitive to exposure to life events over time. Clearly linked to the malleability of MT is the possibility of developing interventions to improve mental toughness. In view of the predictive value of MT in education and the workplace, interventions that aim to increase MT may be effective in promoting success in different domains. However, before drawing any applied implications, research that aims at exploring the factors that influence the development of MT and the mechanisms that underlie the association between MT and performance in education and work is needed.

The findings of the present research should be interpreted in light of some limitations. One concern of our findings was limited statistical power because of the modest sample sizes ($N = 49$ in Study 1 and $N = 100$ in Study 2). Furthermore, Study 1 was limited to Psychology students at one university. ~~Although our post-hoc analyses revealed a moderate-to-high (Study 1) and a high power (Study 2) to obtain the effect sizes observed in the current studies,~~ Ffuture studies should examine MT using a larger sample across a broader spectrum of degree subjects and across universities.

Self-report measures were used to assess MT and individuals' income; hence socially desirable responses could have influenced the results. While longitudinal data was obtained for academic grades and attendance, we did not assess MT longitudinally. The longitudinal

nature of the data on academic grades provided a more reliable index of academic performance in comparison to the measure that was used by the only previous study on this topic (See Crust et al., 2014). However, the lack of longitudinal data on MT does not allow making inferences about the directionality and causality of the reported associations. For example, it is possible that having higher MT levels predicts positive academic outcomes; or that academic success facilitates the development of MT. As such, future research could aim at collecting longitudinal data for both MT and academic performance to shed light on the direction of the relationship between the two variables. Furthermore, some studies reported that MT correlates with indices of cognitive ability (see for example, Delaney et al., 2015; Hardy et al., 2014); as such it is possible that MT influences academic performance positively by increasing cognitive performance. Future studies could collect longitudinal data on MT, academic performance and cognitive ability in order to explore, whether MT has an effect on academic performance over and above the effect of cognitive ability on undergraduate students' academic grades.

Income was used as the only index of career success in the current research. Although research has suggested that income is tightly associated with subjective evaluation of career success, such as career satisfaction (Raabe, Frese, & Beehr, 2007) and job attitudes (Gattiker & Larwood, 1989), future studies could incorporate different objective and subjective markers of career success. It is highly possible that higher MT is also related to greater job satisfaction, as it has been shown that mentally tough individuals were more likely to experience flow, an intrinsically motivating experiences that lead to high performance (Crust & Swann, 2013). In addition, income could be an index of career success but only within a particular profession. It is possible that particular professions facilitate the development of MT and offer better opportunities for an individual to achieve higher income.

This association could explain the positive link between MT and income observed in our study. The current study's design does not allow disentangling the effect of MT on income from the possible effect of a particular profession on both MT and income. Finally, the cross-sectional design of this study does not offer the opportunity to make inferences about the causality of the reported associations. It is possible for example, that higher income contributes to higher levels of MT. Future studies could attempt to solve this issue by collecting longitudinal data on both MT and income.

In conclusion, the present findings should be viewed as the beginning of understanding the role of MT in educational and work settings. The findings support previous literature suggesting that MT is an important personality trait in relation to academic and career success. By addressing the aforementioned limitations of this series of studies, future research could attempt to identify the nature of the association between MT and academic and career achievement, the factors that underlie these associations and the parameters that contribute to the development of MT. Finally, specific aspects of MT, such as the scale of commitment and confidence, may be more malleable than the other aspects of MT. Targeting these aspects of MT could maximize the effectiveness of intervention programs that aim at optimizing performance across achievement contexts.

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