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Do Individual Differences in Emotion Regulation Mediate the Relationship Between Mental
Toughness and Symptoms of Depression?

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Abstract

Mental Toughness (MT) provides crucial psychological capacities for achievement in sports, education, and work settings. Previous research examined the role of MT in the domain of mental health and showed that MT is negatively associated with and predictive of fewer depressive symptoms in non-clinical populations. The present study aimed at 1) investigating to what extent mentally tough individuals use two emotion regulation strategies: cognitive reappraisal and expressive suppression; 2) exploring whether individual differences in emotion regulation strategy use mediate the relationship between MT and depressive symptoms. Three hundred sixty-four participants ($M = 24.31$ years, $SD = 9.16$) provided self-reports of their levels of MT, depressive symptoms, and their habitual use of cognitive reappraisal and expressive suppression. The results showed a statistically significant correlation between MT and two commonly used measures of depressive symptoms. A small statistically significant positive correlation between MT and the habitual use of cognitive reappraisal was also observed. The correlation between MT and the habitual use of expressive suppression was statistically significant, but the size of the effect was small. A statistical mediation model indicated that individual differences in the habitual use of expressive suppression mediate the relationship between MT and depressive symptoms. No such effect was found for the habitual use of cognitive reappraisal. Implications of these findings and possible avenues for future research are discussed.

Keywords: mental toughness, depression, emotion regulation, cognitive reappraisal,

expressive suppression

Do Individual Differences in Emotion Regulation Mediate the Relationship Between Mental Toughness and Symptoms of Depression?

1 Previous research showed that individual differences in Mental Toughness (MT)
2 negatively correlate with depressive symptoms (e.g., Brand et al., 2014b). Furthermore, the
3 habitual use of certain emotion regulation strategies is associated with individual variation in
4 depressive symptoms (e.g., Haga, Kraft, & Corby, 2009). The present study investigates
5 whether individual differences in the habitual use of two emotion regulation strategies —
6 cognitive reappraisal and expressive suppression — mediate the relationship between MT
7 and depressive symptoms.

8 Research on resilience has shown that several factors may have a protective function
9 on individuals experiencing adversity (Luthar & Zelazo, 2003). These range from having
10 caring and supportive relationships (e.g., Crosnoe & Elder, 2004) to personal characteristics
11 such as hardiness (Kobasa, 1979). A construct that has recently been explored in relation to
12 mental health outcomes — such as depressive symptoms — is MT.

13 **Mental Toughness**

14 MT refers to a broad array of positive characteristics, such as having a high sense of
15 self-belief, which aid coping with difficult situations (Hardy, Imose, & Day, 2014). A
16 possible advantage of MT over other resilience traits is that it does not only reflect an
17 effective coping mechanism for stressors; but it enables individuals to proactively seek out
18 opportunities for personal growth (e.g., St Clair-Thompson et al., 2015). Another possible
19 advantage of MT is that it can be developed partially through positive youth experiences
20 (Gould, Griffes, & Carson, 2011). These may include a particular motivational climate (e.g.,
21 enjoyment, challenge, and mastery experiences), external assets such as social support
22 networks, and certain developmental experiences (e.g., critical incidents, competitive rivalry,
23 vicarious experiences, and demonstration of ability; Connaughton, Hanton, & Jones, 2010;

24 Connaughton, Wadey, Hanton, & Jones, 2008). For example, a study by (Jones & Parker,
25 2013) showed that positive youth experiences were associated with higher levels of MT in
26 young athletes. Specifically, initiative experiences were associated with high levels of MT
27 and may therefore be worth promoting.

28 Mentally tough individuals approach, react to, and appraise pressure, challenge, and
29 adversity as opportunities for self-development. Consequentially, they persist in reaching
30 their goals (Gucciardi, Gordon, & Dimmock, 2009a). Although MT was initially
31 predominantly applied in the sport arena (Crust & Keegan, 2010), it is now being researched
32 in other performance environments such as the workplace (Godlewski & Kline, 2012;
33 Marchant et al., 2009) and education (McGeown, St Clair-Thompson, & Clough, 2016; St
34 Clair-Thompson et al., 2015).

35 The most widely used conceptual basis of MT is the 4C's model of MT (Clough,
36 Earle, & Sewell, 2002). According to Clough et al. (2002), mentally tough individuals (1)
37 perceive themselves as being in **control** of life situations (i.e., feel and act as if they were
38 influential), (2) show **commitment** to their actions (i.e., involve themselves rather than
39 experience alienation from an encounter), (3) view **challenge** as an opportunity rather than a
40 threat (i.e., holding the view that life is changeable and that this can lead to self-
41 development), and (4) have high levels of **confidence** (i.e., a high sense of self-belief and
42 faith in having the ability to achieve success).

43 Previous studies, which employed the 4C's model of MT, showed that individual
44 variation in MT is associated with a number of positive outcomes. These include higher
45 academic attainment and attendance, less counterproductive classroom behavior, greater
46 social inclusion (St Clair-Thompson et al., 2015), better sleep quality (Brand et al., 2014a;
47 Brand et al., 2014b), higher levels of psychological wellbeing (e.g., Stamp et al., 2015), more
48 engagement with physical activity (Gerber et al., 2012), and better memory performance

49 (Delaney, Goldman, King, & Nelson-Gray, 2015; Dewhurst, Anderson, Cotter, Crust, &
50 Clough, 2012). Clough and Strycharczyk (2015) coined the term ‘the mental toughness
51 advantage’ to describe this cluster of positive characteristics.

52 A review by McGeown et al. (2016) discussed MT in terms of the extent to which it
53 aligns with other non-cognitive attributes, including resilience (e.g., Putwain, Nicholson,
54 Connors, & Woods, 2013), buoyancy (e.g., A. J. Martin & Marsh, 2008), self-efficacy (e.g.,
55 Caprara, Vecchione, Alessandri, Gerbino, & Barbaranelli, 2011; Stankov & Lee, 2014),
56 confidence (e.g., Stankov & Lee, 2014), and motivation (e.g., Lepper, Corpus, & Iyengar,
57 2005). They proposed that the main advantage of MT appears to be its multidimensionality,
58 which offers the opportunity to consolidate a number of other concepts, such as resilience,
59 and to investigate them beneath a single umbrella. Moreover, its use of multiple
60 subcomponents may allow for the development of more targeted and flexible interventions
61 compared to a unidimensional construct.

62 While the 4C’s model of MT shares some conceptual foundation with hardiness, it
63 differs in its additional emphasis on confidence in one’s abilities and interpersonal relations.
64 Hardiness was described by Kobasa (1979) as a personality disposition that provides
65 resistance to stress. Mentally tough individuals are not only able to remain committed when
66 confronting with stress, they are also confident about successfully completing their tasks and
67 are assertive in social situations. MT is also distinct from grit, described by Duckworth,
68 Peterson, Matthews, and Kelly (2007) as perseverance and passion for long-term goals.
69 While individuals who score high on grit may work strenuously toward goals despite self-
70 doubt, individuals who score high on MT believe they are truly worthwhile people and
71 maintain the self-confidence to achieve their goals. Another distinction is that MT not only
72 places an emphasis on action, but also on affect, namely, emotional control. Mentally tough

73 individuals are able to control their emotions effectively in the face of setbacks and
74 challenges.

75 **Mental Toughness and Emotion Regulation**

76 When individuals experience emotions, these typically promote behavioral response
77 tendencies that are relevant to the emotion-eliciting event (Gross, 2015). Such response
78 tendencies can either be helpful (e.g., when they enhance social interaction) or harmful (e.g.,
79 when they bias cognition and behavior in a maladaptive way; Gross & Jazaieri, 2014). When
80 emotions are unhelpful or even harmful, individuals typically draw on emotion regulation.
81 There are numerous emotion regulation strategies that exert variable influences on cognition,
82 emotion, and behavior (Gross, 2001). Cognitive reappraisal involves reinterpreting the
83 subjective meaning of emotion-eliciting stimuli to alter the emotional response, and it is
84 regarded as an effective emotion regulation strategy in many contexts (Ochsner & Gross,
85 2005). On the other hand, expressive suppression is characterized by ongoing efforts to
86 inhibit emotion-expressive behavior and is frequently regarded as a less adaptive emotion
87 regulation strategy (Moore, Zoellner, & Mollenholt, 2008). However, it is worth noting that
88 the consequences of different emotion regulation strategies may be context-dependent: for
89 instance, cognitive reappraisal might be less adaptive when applied to stressors that can be
90 controlled (Troy, Shallcross, & Mauss, 2013).

91 There is currently no research that explored the type of emotion regulation strategies
92 that mentally tough individuals use. It seems reasonable to suggest that MT would be closely
93 linked to emotional regulation, and there are three main reasons to expect this: firstly, the
94 4C's model of MT has emotional control as one of its core dimensions. The validity of this
95 inclusion has been supported by a number of authors (e.g., Crust & Swann, 2011; Perry,
96 Clough, Crust, Earle, & Nicholls, 2013; St Clair-Thompson et al., 2015), although there has
97 been some criticism of the validity of the model (e.g., Gucciardi, Hanton, and Mallett (2012)

98 found no support for the psychometric properties of the Mental Toughness Questionnaire 48,
99 a self-report questionnaire widely used in MT research and based on the 4C's model). The
100 emotional control dimension of the 4C's model includes items with aspects of both cognitive
101 reappraisal and expressive suppression. Secondly, Nicholls et al. (2015) have shown that MT
102 is closely link to self-regulation in a wider context, allowing tougher individuals to prosper in
103 adverse circumstances. Finally, Nicholls, Polman, Levy, and Backhouse (2008) showed that
104 MT was associated with more problem-focused or approach coping strategies (i.e., reducing
105 or eliminating the stressor) such as mental imagery, effort expenditure, thought control, and
106 logical analysis. At the same time, mentally tough individuals used avoidance coping
107 strategies such as distancing, mental distraction or resignation less frequently. Kaiseler,
108 Polman, and Nicholls (2009) also reported that, in the context of a self-selected stressor, MT
109 was associated with more problem-focused coping strategies. Hence it could be argued that
110 mentally tough individuals more readily adapt problem-focused strategies because of their
111 ability to regulate their emotions.

112 Pertinently, Aldwin (2007) has suggested that the use of cognitive reappraisal may
113 facilitate problem-focused coping. For example, a student who feels distressed because she
114 received a poor grade on a very important exam might positively reappraise her situation as
115 an additional opportunity to revisit the course content before the re-sit. As a result, she may
116 feel less distressed about her current situation (due to cognitive reappraisal) and studies the
117 course content in greater depth, eventually passing the final exam (due to problem-solving).
118 At first glance, this might seem in contrast with Troy et al. (2013) who suggested that
119 cognitive reappraisal may be less adaptive when applied to controllable situations (e.g.,
120 individuals who decrease their negative emotions through cognitive reappraisal may lose
121 motivation to take action in situations in which action is needed, eventually leading to worse
122 outcomes). However, we suggest that cognitive reappraisal might in some instances still be

123 adaptive when applied to a controllable stressor: if it is used to alter the emotional impact of a
124 stressor *and* promotes problem-solving. Individuals who score high on MT may use
125 cognitive reappraisal more often than other emotion regulation strategies (e.g., expressive
126 suppression) to enhance problem-focused coping strategies.

127 The habitual use of cognitive reappraisal has been shown to benefit affective
128 functioning, social interactions, and well-being (Gross & John, 2003), whereas the habitual
129 use of expressive suppression is associated with decreased positive emotions, self-esteem,
130 and psychological adjustment (Nezlek & Kuppens, 2008). In fact, previous studies
131 demonstrated that the habitual use of cognitive reappraisal is negatively associated with
132 depressive symptoms, whereas the habitual use of expressive suppression shows a positive
133 relationship with depressive symptoms (Haga et al., 2009).

134 **Mental Toughness and Depression**

135 A small number of studies have explored the degree to which MT is associated with
136 individual differences in symptoms of psychopathology, for instance depression. It has been
137 shown that MT is predictive of fewer depressive symptoms 10 months later in a sample of
138 vocational students (Gerber, Brand, et al., 2013) and that MT is negatively associated with
139 depressive symptoms in high school students, undergraduates (Gerber, Kalak, et al., 2013),
140 and adolescents (Brand et al., 2014b). A possible explanation for the reported association
141 between MT and depressive symptoms is that individuals scoring high on MT are less
142 affected by emotion-provoking stimuli. However, MT and affect intensity/emotional
143 reactivity (i.e., the tendency to react strongly to emotion-eliciting events) were unrelated in a
144 sample of sport performers (Crust, 2009). As such, the idea that mentally tough individuals
145 remain unaffected by competition or adversity due to experience of less intense emotions was
146 not supported. Although this finding requires replication before one can make any firm
147 conclusions, a conceivable implication of this study is that emotion regulation plays an

148 important role in understanding the relationship between MT and depressive symptoms.

149 Perhaps, mentally tough individuals cope with their emotions differently and resort on more

150 adaptive emotion regulation strategies, such as a more frequent use of cognitive reappraisal.

151 To date, no studies that have explored the role of emotion regulation strategies in explaining

152 the negative correlation between MT and depressive symptoms. This seems to be an

153 important area of investigation because understanding potential mediator variables could be

154 useful in developing more targeted interventions to counteract depressive symptoms.

155 **The Present Study**

156 Most previous studies on MT and depressive symptoms involved participants in

157 highly stressful environments, potentially at high risk for maladjustment (Wynaden,

158 Wichmann, & Murray, 2013). In order to test whether these findings can be generalized to a

159 broader range of people, the present study aims to extend previous research by investigating

160 how MT relates to depressive symptoms in a sample taken from the general population. This

161 is an important issue to address in order to determine whether or not MT is a useful concept

162 in the domain of mental health beyond groups of individuals in stressful environments. In

163 line with previous research, we hypothesized that: 1) MT is negatively correlated with

164 depressive symptoms; 2) individual differences in cognitive reappraisal are negatively

165 correlated with depressive symptoms; 3) individual differences in expressive suppression are

166 positively correlated with depressive symptoms. Since mentally tough individuals showed

167 fewer depressive symptoms in previous studies, we hypothesized that they differ in terms of

168 the strategies that they use to regulate their emotions. More specifically, we hypothesized

169 that: 4) MT is positively correlated with the habitual use of cognitive reappraisal; 5) MT is

170 negatively correlated with the habitual use of expressive suppression. Lastly, we tested a

171 statistical mediation model, which explores whether the relationship between MT and

172 depressive symptoms is mediated by individual differences in the habitual use of cognitive
173 reappraisal and expressive suppression.

174 **Method**

175 **Participants**

176 Participants ($N = 364$) were recruited online through advertisements on social
177 networks (e.g., Facebook) as well as through word of mouth. Our sample comprised
178 individuals of 43 different nationalities, with Singaporean and British participants
179 constituting the two largest groups (24.5% and 23.6%, respectively). A majority of 50.3% of
180 the participants were native English speakers. The mean age was 24.31 years ($SD = 9.16$,
181 range 18-79) and 56.9% of the participants were female. Informed consent was obtained
182 from all participants after they had received detailed information about the purpose of the
183 study. London Metropolitan University's ethics committee granted approval for this project.

184 **Measures**

185 **Mental toughness.** The Mental Toughness Questionnaire 48 (MTQ48) is the most
186 frequently used measure of MT as conceptualized by Clough et al. (2002). It has an average
187 completion time of 10 minutes, and responses to its 48 items are given on a 5-point Likert
188 scale anchored at 1 = *strongly disagree* and 5 = *strongly agree*. Twenty-two items are
189 reverse coded; scores of the four main scales (challenge, commitment, confidence, and
190 control) as well as four additional subscales (confidence in own abilities, interpersonal
191 confidence, life control, and emotional control) can be obtained by calculating the mean of
192 the scores that were reported for the items of each scale. An overall MT score can be
193 obtained by calculating an overall mean score. Example items include "I can usually adapt
194 myself to challenges that come my way" (challenge) and "I don't usually give up under
195 pressure" (commitment). The MTQ48 has generally shown good reliability, and the MTQ48

196 has received support for its factor structure through confirmatory factor analyses and
197 exploratory structural equation modelling (Horsburgh, Schermer, Veselka, & Vernon, 2009).

198 **Emotion regulation strategy use.** The Emotion Regulation Questionnaire (ERQ;
199 Gross & John, 2003) was used to assess individual differences in the habitual use of cognitive
200 reappraisal and expressive suppression as emotion regulation strategies. The questionnaire
201 has an average completion time of less than 2 minutes, and responses to its 10 items are given
202 on a 7-point Likert scale ranging from 1 = *strongly disagree* to 7 = *strongly agree*. Scores of
203 the two subscales of the ERQ can be calculated by summing up the scores that were reported
204 for individual items of the scales. Higher scores indicate more frequent use of the respective
205 emotion regulation strategy. Example items include "I control my emotions by changing the
206 way I think about the situation I'm in" (cognitive reappraisal) and "I control my emotions by
207 not expressing them" (expression suppression). Confirmatory factor analyses have supported
208 the factor structure of the instrument (Melka, Lancaster, Bryant, & Rodriguez, 2011).

209 **Symptoms of depression.** The Clinically Useful Depression Outcome Scale
210 (CUDOS; Zimmerman, Chelminski, McGlinchey, & Posternak, 2008) was used to assess the
211 DSM-IV symptoms of major depressive disorder. It has an average completion time of less
212 than 3 minutes, and responses to its 16 items are given on a 5-point Likert scale indicating
213 how well the particular item describes the respondent during the past week (0 = *not at all*
214 *true*, 1 = *rarely true*, 2 = *sometimes true*, 3 = *often true*, and 4 = *almost always true*). An
215 overall score can be calculated by summing up the scores that were reported for individual
216 items of the questionnaire; higher scores indicate more depressive symptoms. Example items
217 include "I felt sad or depressed" and "I had more difficulties making decisions than usual".
218 The CUDOS was shown to demonstrate high internal consistency, test-retest reliability as
219 well as convergent and discriminant validity (Zimmerman et al., 2014).

220 The Patient Health Questionnaire 9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001)
221 was used as an alternative instrument to measure the DSM-IV symptoms of major depressive
222 disorder, since – to the best of our knowledge – no studies have assessed the construct and
223 criterion validity of the CUDOS in the general population. It has an average completion time
224 of less than 2 minutes and assesses how often the respondent has experienced symptoms of
225 depression over the past two weeks. Responses to its nine items are given by assigning
226 values of 0 to 3 points (0 = *not at all*, 1 = *several days*, 2 = *more than half of the days*, and 3
227 = *nearly every day*). An overall score can be calculated by summing up the scores that were
228 reported for individual items of the questionnaire; higher scores indicate more symptoms of
229 depression. Example items include "Feeling down, depressed, or hopeless" and "Feeling
230 tired or having little energy". The PHQ-9 not only recognizes clinical depression but also
231 subthreshold levels of depressive symptoms in the general population (A. Martin, Rief,
232 Klaiberg, & Braehler, 2006). High internal consistency, test-retest reliability as well as
233 construct and criterion validity were demonstrated in a study by Bian, Li, Duan, and Wu
234 (2011).

235 **Procedure**

236 All questionnaires were combined to form a single document and made available
237 online via SurveyMonkey (www.surveymonkey.com). Each participant received a message
238 containing a link to the online questionnaire and password access as well as a unique
239 participant code. After they agreed to take part in our study, participants were asked for
240 demographic variables (age, gender, level of education, language, nationality and religion)
241 and contact details. Questionnaire completion was self-paced, and participants could only
242 proceed to the subsequent page once they had answered all items. Upon completion of the
243 study, participants were given an online written debrief.

244 **Statistical Analysis**

245 Demographics and questionnaire data were examined using SPSS (Version 20.0).
246 Since the scores of the PHQ-9 were positively skewed and peaked relative to the normal
247 distribution, we applied a square root transformation of the data before undertaking further
248 statistical analyses. Separate analyses with the untransformed PHQ-9 data yielded similar
249 results (not reported here). The scores of the remaining variables were approximately
250 normally distributed (see Table 1 for details). No observations were eliminated from the
251 analyses reported hereafter. The internal consistency of the questionnaires was estimated by
252 McDonald's (1999) *Omega* statistic using the MBESS package (Kelley & Lai, 2012) for
253 RStudio (Version 0.98.932). Omega is a more sensible index of internal consistency than
254 Cronbach's alpha due to less risk for over-/underestimation of reliability (Dunn, Baguley, &
255 Brunsden, 2014). Since previous research indicated that MT increases with age (Marchant et
256 al., 2009), we included age as a covariate in all analyses. Separate analyses without age as a
257 covariate were performed and yielded similar results (not reported here). We also tested
258 whether language, nationality, gender or religion had an effect on MT. However, none of
259 these variables significantly influenced MT and were thus not controlled for in further
260 analyses.

261 **Mediation Analysis.** To test the hypothesis that individual differences in the habitual
262 use of cognitive reappraisal and expressive suppression mediate the relationship between MT
263 and symptoms of depression, we performed hierarchical regression analyses using the
264 PROCESS macro for SPSS (Version 2.13; (Hayes, 2012). PROCESS utilizes an ordinary
265 least squares path analytical framework to estimate direct, indirect, and total effects of
266 mediation models. The direct effect provides an estimate of the effect of the independent
267 variable (IV) on the dependent variable (DV). The indirect effect of the IV on the DV via a
268 potential mediator (M) can be estimated from bias-corrected bootstrap 95% confidence
269 intervals. Confidence intervals that do not contain zero give an indication of a significant

270 mediation effect (Hayes, 2013). The total effect provides an estimate of the combined direct
271 and indirect effects. In the present study we used 5000 bootstrap resamples as suggested by
272 Preacher and Hayes (2008). The bootstrapping approach to estimating indirect effects is
273 advantageous over traditional procedures, as it does not rely on assumptions about the
274 distribution of the indirect effect.

275 **Results**

276 Descriptive statistics of the MTQ48, CUDOS, PHQ-9 as well as the cognitive
277 reappraisal and expressive suppression scales of the ERQ are presented in Table 1.

278

279 [Insert Table 1]

280

281 Table 2 presents partial correlations between the main study variables and reliability
282 estimates. As expected, the MTQ48 total index was negatively associated with both
283 measures of depressive symptoms (CUDOS $r = -.53, p < .001, 95\% \text{ CI } [-.60, -.44]$ and PHQ-
284 9 $r = -.49, p < .001, 95\% \text{ CI } [-.56, -.40]$). Cognitive reappraisal was negatively associated
285 with both the CUDOS and the PHQ-9 ($r = -.18, p < .001, 95\% \text{ CI } [-.29, -.06]$ and $r = -.19, p <$
286 $.001, 95\% \text{ CI } [-.30, -.08]$, respectively), whereas expressive suppression showed a positive
287 correlation with both measures of depressive symptoms (CUDOS $r = .18, p < .001, 95\% \text{ CI }$
288 $[.07, .29]$ and PHQ-9 $r = .19, p < .001, 95\% \text{ CI } [.08, .30]$). In line with our hypotheses, we
289 also found a positive correlation between MT and the use of cognitive reappraisal ($r = .26, p$
290 $< .001, 95\% \text{ CI } [.15, .36]$) and a negative correlation between MT and the use of expressive
291 suppression ($r = -.19, p < .001, 95\% \text{ CI } [-.29, -.09]$).

292

293 [Insert Table 2]

294

295 **Mediation Analysis**

296 Figure 1 illustrates our proposed mediation model. Table 3 and Table 4 provide
297 detailed statistics for our mediation analyses. In line with our hypotheses, the indirect effects
298 of MT on depressive symptoms, through individual differences in expressive suppression,
299 were statistically significant (PHQ-9: indirect effect = -0.05, $SE = 0.03$, 95% CI [-0.131, -
300 0.007]; CUDOS: indirect effect = -0.44, $SE = 0.27$, 95% CI [-1.108, -0.020]). However, we
301 failed to obtain evidence that individual differences in cognitive reappraisal mediate the
302 relationship between MT and depressive symptoms (PHQ-9: indirect effect = -0.05, SE
303 = 0.04, 95% CI [-0.137, 0.019]; CUDOS: indirect effect = -0.29, $SE = 0.37$, 95% CI [-1.123,
304 0.355]). To test whether an alternative mediation model with emotion regulation strategy use
305 as the IV, MT as the mediator, and depressive symptoms as the DV might be more
306 appropriate in accounting for the relationship between MT, depressive symptoms, and
307 emotion regulation strategy use, we ran post-hoc exploratory analyses. The total effect sizes
308 for such alternative model were all smaller than .04, hence this seems less supported by the
309 data compared with our initial proposal (data not reported here).

310

311 [Insert Figure 1]

312

313 [Insert Table 3]

314

315 [Insert Table 4]

316

317

Discussion

318

319 The present study explored the degree to which individual variation in MT is
associated with individual differences in depressive symptoms. Previous research showed

320 that the habitual use of cognitive reappraisal was negatively associated with depressive
321 symptoms, whereas the opposite applied to the habitual use of expressive suppression (Haga
322 et al., 2009). We examined the relationship between these variables in our sample and
323 investigated how individual variation in MT relates to the habitual use of cognitive
324 reappraisal and expressive suppression. Lastly, we tested a statistical mediation model that
325 explored whether individual differences in the habitual use of cognitive reappraisal and
326 expressive suppression mediate the relationship between MT and depressive symptoms.

327 In line with previous studies (Brand et al., 2014b; Gerber, Brand, et al., 2013; Gerber,
328 Kalak, et al., 2013), we showed that there is a significant and moderately strong inverse
329 relationship between MT and two measures of depressive symptoms. We extend prior
330 research by demonstrating that this finding does not only apply to selective populations, such
331 as adolescents or university students, but also to a more inclusive sample taken from the
332 general population. As such, MT seems to be a useful concept in the domain of mental
333 health, beyond groups of individuals in potentially highly stressful environments. Studying
334 MT in relation to individual differences in depressive symptoms is important, given that there
335 is a close relationship between psychological resources and psychopathological symptoms
336 (Lee & Hankin, 2009). Furthermore, MT has been linked to educational achievement (St
337 Clair-Thompson et al., 2015), and psychopathological symptoms have been shown to
338 associate with decreased performance in educational (Andrews & Wilding, 2004) and
339 occupational (Wang et al., 2014) settings. Hence, exploring whether MT is linked to
340 depressive symptoms can have significant implications for understanding educational and
341 work performance. Finally, given that MT is at least to some extent amenable to
342 development through targeted interventions (Crust & Clough, 2011; Gucciardi, Gordon, &
343 Dimmock, 2009b; Sheard & Golby, 2006) MT training might appeal to those individuals who
344 are skeptical about the meaning and usefulness of more conventional health interventions

345 (Gerber, Kalak, et al., 2013). As such, MT constitutes an important concept in the domain of
346 mental health, and fostering MT might be a valuable intervention to counteract depressive
347 symptoms.

348 We also showed that the habitual use of cognitive reappraisal is negatively associated
349 with depressive symptoms, while the habitual use of expressive suppression showed the
350 reverse pattern. This finding is in line with much of the emotion regulation literature (Gross,
351 Richards, & John, 2006; John & Gross, 2004) and provides some additional support for the
352 common view that cognitive reappraisal is — in most contexts — a more adaptive emotion
353 regulation strategy than expressive suppression (Haga et al., 2009). It needs to be noted that
354 although these associations are statistically highly significant, the effect sizes are relatively
355 small. This is perhaps not surprising, given the plethora of factors precipitating and
356 perpetuating depressive symptoms. The size of this effect is similar to that obtained through
357 a meta-analysis by Aldao, Nolen-Hoeksema, and Schweizer (2010), which looked at the
358 association between cognitive reappraisal and depressive symptoms based on the data of
359 seven studies.

360 The present study adds to the current literature on MT in that it is the first study that
361 investigated how mentally tough individuals regulate their emotions, despite the centrality of
362 emotional control in most models of MT. We showed that individuals scoring high on MT
363 more frequently use cognitive reappraisal to regulate their emotions, although the size of this
364 effect is comparatively small. They resort to the use of expressive suppression less
365 frequently; but given the marginal size of this effect, this finding is less conclusive. We
366 could only partially support our hypothesis that the relationship between MT and symptoms
367 of depression is mediated by individual differences in emotion regulation strategy use. The
368 analyses showed that individual differences in the habitual use of expressive suppression
369 appear to mediate the relationship between MT and depressive symptoms. However, we did

370 not obtain supporting evidence for our hypothesis that individual differences in the habitual
371 use of cognitive reappraisal mediate the relationship between MT and symptoms of
372 depression. Since cognitive reappraisal tends to be less adaptive when applied to controllable
373 situations (Troy et al., 2013), which individuals scoring high on MT, conceptually, perceive
374 more often, the boundary conditions of reappraisal effectiveness might explain the lack of a
375 significant mediation effect. However, whether individuals scoring high on MT actually
376 experience controllable situations more often has not been directly tested and would open up
377 possible avenues for future research.

378 There are several alternative explanations for the association between MT and
379 depressive symptoms. It might be that the dysfunctional thoughts and maladaptive
380 tendencies that are characteristic of depressive symptoms are incompatible with current
381 conceptualizations of MT. Whereas mentally tough individuals have a strong tendency to
382 view their personal environment as controllable, perceive themselves as capable and
383 influential, and stay committed under adverse circumstances, individuals experiencing
384 depressive symptoms typically manifest the reverse pattern. Another finding that could
385 partially explain why mentally tough individuals show fewer depressive symptoms is that
386 individuals with high levels of MT more frequently rely on problem-oriented coping (i.e.,
387 strategies used to minimize distress by reducing or eliminating the stressor) rather than
388 emotion-focused (i.e., regulate emotional arousal and distress) or avoidance coping (i.e.,
389 behavioral or psychological efforts to disengage from a stressful situation; (Nicholls, Polman,
390 Levy, & Backhouse, 2009). Individuals suffering from depression frequently use avoidance
391 coping strategies (Cribb, Moulds, & Carter, 2006), which tend to be less effective in reducing
392 the negative consequences associated with experiencing adversity. Accordingly, individuals
393 with low levels of MT may not effectively cope with stress factors, possibly causing an
394 increase in depressive symptoms.

395 Limitations

396 A number of limitations in the present study need to be acknowledged. Even though
397 online data collection has some advantages, such as spending less economic resources or
398 reaching large and diverse samples (Gosling & Mason, 2015), there is less control over the
399 actual completion of the questions (e.g., alone or in the company of others), which might
400 affect responses. As we exclusively relied on self-reported data, we cannot rule out the
401 possibility that the responses were influenced by social desirability and common-method
402 variance (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Furthermore, the cross sectional
403 design of our study did not allow for determining a causal explanation of our data. It remains
404 unclear whether the habitual use of expressive suppression is unfavorable regarding
405 depressive symptoms or depressive symptoms lead to a suppression of emotions. Future
406 research should address these issues by employing longitudinal designs or randomized
407 controlled trials to obtain causal evidence and to test whether or not we can alleviate
408 depressive symptoms by strengthening the MT of an individual or by reducing the habitual
409 use of expressive suppression. Indeed, it would be worthwhile to investigate in future studies
410 whether bolstering levels of MT or reinforcing the use of more adaptive emotion regulation
411 strategies is a more effective strategy to counteract depressive symptoms. Furthermore,
412 exploring physiological parameters might shed light on the relationship between MT and
413 depressive symptoms. A number of studies evinced that there is an association between
414 physical activity and mental health (Deslandes et al., 2009; Fuchs, Hahn, & Schwarzer,
415 1994). Ekkekakis and Acevedo (2006), for instance, showed that participants reported
416 improved mood after exercising, and Azar, Ball, Salmon, and Cleland (2008) have shown an
417 inverse relationship between physical activity and depression. Since mentally tough
418 individuals show higher engagement with physical activity (Gerber et al., 2012), this
419 relationship might constitute another pathway through which MT exerts its effects on

420 depressive symptoms. It has also been shown that MT relates to better sleep quality,
421 including fewer awakenings after sleep onset, less light sleep and more deep sleep (Brand et
422 al., 2014a; Brand et al., 2014b). Since sleep disturbance is a common characteristic of
423 depression and is predictive of recurrent depression (Roberts, Shema, Kaplan, & Strawbridge,
424 2014). As such, future research could explore whether mentally tough individuals show less
425 depressive symptoms due to better sleep quality.

426 In accordance with much recent research, we looked at the two emotion regulation
427 strategies that fulfill the two most frequently reported objectives of emotion regulation:
428 altering emotional experience and expression (Gross et al., 2006). However, it is not clear to
429 what extent a global self-report measure of emotion regulation captures what emotion
430 regulation strategies are used in everyday life; it also does not provide information on the
431 effects of these strategies. Since the effectiveness of emotion regulation is to some extent
432 context-dependent, future investigations should incorporate assessment of contextual factors
433 in which emotion regulation is imbedded (e.g., whether or not the stressor is controllable). It
434 may also be important to assess the effectiveness of emotion regulation strategy
435 implementation in future studies: perhaps mentally tough individuals use the same emotion
436 regulation strategies as others but implement them more effectively. Difficulties in emotion
437 regulation may arise from a number of sources: 1) the identification of the need to regulate
438 emotions; 2) the selection among available regulatory options; 3) implementation of a
439 selected regulatory tactic; 4) monitoring of the implemented emotion regulation strategy over
440 time (for an extensive review see Sheppes, Suri, and Gross (2015)). The present study only
441 assessed emotion regulation strategy implementation. Moreover, because there are numerous
442 other emotion regulation strategies available, future research might provide more insights on
443 how mentally tough individuals regulate their emotions by examining different strategies, and

444 examine how effectively mentally tough individuals alter the intensity, duration, frequency,
445 and category of emotional responses; and how flexible they are in using different strategies.

446 **Conflict of interest**

447 The entire study was conducted without external funding. All authors declare no
448 conflicts of interest.

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Table 1

Descriptive Statistics of MTQ48, CUDOS, PHQ-9, Cognitive Reappraisal, and Expressive Suppression

Variable	<i>M</i>	<i>SD</i>	Median	Mode	Range	Kurtosis	Skewness
MTQ48 total index	3.44	0.37	3.45	3.23	2.19	0.24	-0.33
Challenge	3.56	0.43	3.63	3.75	2.63	0.24	-0.28
Commitment	3.56	0.54	3.55	3.73	3.27	0.23	-0.14
Control	3.32	0.37	3.36	3.50	2.57	0.75	-0.44
Confidence	3.40	0.51	3.40	3.27	3.00	0.07	-0.51
CUDOS	18.33	10.33	17	16	52	0.25	0.57
PHQ-9	5.57	4.75	5	5	26	2.56	1.42
Cognitive Reappraisal	29.25	5.65	30	31	31	0.38	-0.36
Expressive Suppression	14.61	4.82	15	16	24	-0.69	0.09

Note. $N = 364$. M = mean; SD = standard deviation; MTQ48 = Mental Toughness Questionnaire 48; CUDOS = Clinically Useful Depression

Outcome Scale; PHQ-9 = Patient Health Questionnaire 9.

Table 2

Partial Correlations of MTQ48, CUDOS, PHQ-9 (transformed), Cognitive Reappraisal, and Expressive Suppression

Variable	1	2	3	4	5	6	7	8	9
1. MTQ48 total	(.93)								
	-								
2. Challenge	.68** [.64, .75]	(.60) [.53, .66]							
3. Commitment	.83** [.79, .86]	.48** [.39, .57]	(.80) [.77, .84]						
4. Control	.77** [.71, .81]	.41** [.31, .51]	.57** [.48, .65]	(.63) [.54, .70]					
5. Confidence	.85** [.82, .88]	.52** [.45, .60]	.55** [.47, .62]	.48** [.39, .57]	(.80) [.76, .83]				
6. CUDOS	-.53** [-.60, -.44]	-.20** [-.30, -0.10]	-.46** [-.54, -.37]	-.45** [-.54, -.36]	-.48** [-.56, -.38]	(.89) [.87, .91]			
7. PHQ-9 (transf.)	-.49**	-.18**	-.40**	-.42**	-.46**	.79**	(.86)		

	[-.56, -.40]	[-.27, -.09]	[-.48, -.31]	[-.50, -.34]	[-.54, -.36]	[.75, .83]	[.83, .89]		
8. CR	.26**	.24**	.21**	.15*	.24**	-.18**	-.19**	(.80)	
	[.15, .36]	[.14, .34]	[.10, .31]	[.03, .26]	[.13, .32]	[-.29, -.06]	[-.30, -.08]	[.76, .84]	
9. ES	-.19**	-.09	-.12*	.11*	-.38**	.18**	.19**	-.11*	(.77)
	[-.29, -.09]	[-.19, .02]	[-.23, -.01]	[.01, .22]	[-.47, -.29]	[.07, .29]	[.08, .30]	[-.21, -.01]	[.73, .81]

Note. $N = 364$. Numbers in brackets represent the lower and upper limits of the bias-corrected and accelerated 95% confidence intervals (1000 resamples). Numbers in parentheses represent coefficient omega values; for the MTQ-48 total, the number in parentheses represents McDonald's ω_t value. MTQ48 = Mental Toughness Questionnaire 48; CUDOS = Clinically Useful Depression Outcome Scale; PHQ-9 = Patient Health Questionnaire 9; CR = Cognitive Reappraisal; ES = Expressive Suppression.

* $p < .05$. ** $p < .001$.

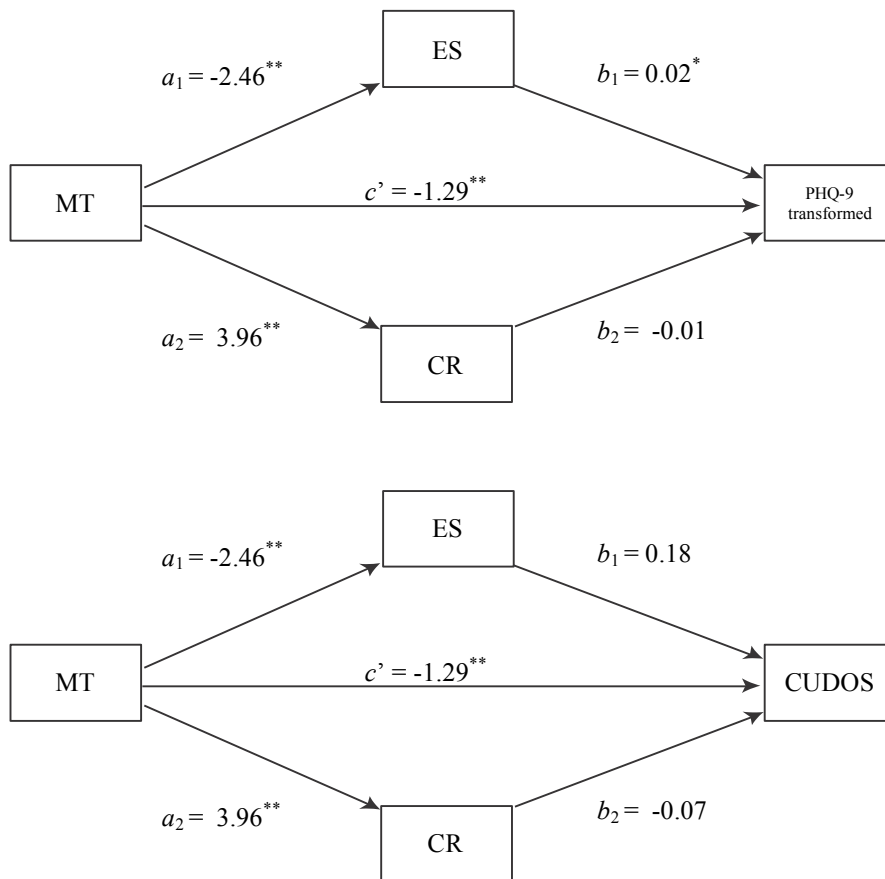


Figure. 1. Multiple mediator model of the indirect effect of Mental Toughness (Mental Toughness Questionnaire 48 total index) on symptoms of depression (top figure: PHQ-9 [transformed]; bottom figure: CUDOS). Regression coefficients are unstandardized. MT = Mental Toughness; ES = Expressive Suppression; CR = Cognitive Reappraisal; PHQ-9 = Patient Health Questionnaire 9; CUDOS = Clinically Useful Depression Outcome Scale.

* $p < .05$. ** $p < .001$.

Table 3

Multiple Mediator Model of the Indirect Effect of Mental Toughness on Symptoms of Depression (PHQ-9 [transformed])

IV (MTQ48)	Total effect		Direct effect		IV → ES		ES→PHQ-9		Indirect effect ES			IV → CR		CR→PHQ-9		Indirect effect CR			
	<i>c</i>	<i>SE</i>	<i>c'</i>	<i>SE</i>	<i>a</i> ₁	<i>SE</i>	<i>b</i> ₁	<i>SE</i>	<i>a</i> ₁ <i>b</i> ₁	<i>SE</i>	95%CI	<i>a</i> ₂	<i>SE</i>	<i>b</i> ₂	<i>SE</i>	<i>a</i> ₂ <i>b</i> ₂	<i>SE</i>	95%CI	
Total index	-1.40 ^{***}	0.13	-1.29 ^{***}	0.14	-2.46 ^{***}	0.67	0.02 [*]	0.01	-0.05	0.03	-0.131, -0.007	3.96 ^{***}	0.78	-0.01	0.01	-0.05	0.04	-0.137,	0.019
Challenge	-0.44 ^{***}	0.13	-0.32 ^{**}	0.13	-1.00	0.56	0.04 ^{***}	0.01	0.04	0.02	-0.100, -0.001	3.15 ^{***}	0.67	-0.03 ^{**}	0.01	-0.08	0.04	-0.179, -0.018	
Commitment	-0.79 ^{***}	0.10	-0.72 ^{***}	0.10	-1.08 [*]	0.47	0.03 ^{**}	0.01	-0.03	0.02	-0.086, -0.005	2.17 ^{**}	0.54	-0.02 [*]	0.01	-0.04	0.02	-0.104, -0.004	
Control	-1.22 ^{***}	0.14	-1.25 ^{***}	0.13	1.49 [*]	0.69	0.05 ^{***}	0.01	0.08	0.04	0.005, 0.180	2.23 ^{**}	0.80	-0.02 [*]	0.01	-0.04	0.03	-0.127, -0.002	
Confidence	-0.95 ^{***}	0.10	-0.89 ^{***}	0.11	-3.60 ^{***}	0.46	0.004	0.01	-0.02	0.04	-0.098, 0.066	2.61 ^{***}	0.57	-0.02	0.01	-0.04	0.03	-0.107, 0.003	

Note. *N* = 364. Regression coefficients are unstandardized. Significant indirect effects are printed in bold. IV = Independent Variable; ES =

Expressive Suppression; CR = Cognitive Reappraisal; MTQ48 = Mental Toughness Questionnaire 48; PHQ-9 = Patient Health Questionnaire 9.

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

Table 4

Multiple Mediator Model of the Indirect Effect of Mental Toughness on Symptoms of Depression (CUDOS)

	Total effect		Direct effect		IV → ES		ES→CUDOS		Indirect effect ES			IV → CR		CR→CUDOS		Indirect effect CR		
	<i>c</i>	<i>SE</i>	<i>c'</i>	<i>SE</i>	<i>a</i> ₁	<i>SE</i>	<i>b</i> ₁	<i>SE</i>	<i>a</i> ₁ <i>b</i> ₁	<i>SE</i>	95%CI	<i>a</i> ₂	<i>SE</i>	<i>b</i> ₂	<i>SE</i>	<i>a</i> ₂ <i>b</i> ₂	<i>SE</i>	95%CI
Total index	-14.57 ^{***}	1.24	-13.84 ^{***}	1.29	-2.46 ^{***}	0.67	0.18	0.10	-0.44	0.27	-1.108, -0.020	3.96 ^{***}	0.78	-0.07	0.08	-0.29	0.37	-1.123, 0.355
Challenge	-4.72 ^{***}	1.22	-3.68 ^{**}	1.24	-1.00	0.56	0.33 ^{**}	0.11	-0.33	0.22	-0.900, -0.008	3.15 ^{***}	0.67	-0.23 [*]	0.09	-0.71	0.39	-1.658, -0.106
Commitment	-8.72 ^{***}	0.89	-8.13 ^{***}	0.91	-1.08 [*]	0.47	0.26 ^{**}	0.10	-0.28	0.17	-0.725, -0.041	2.17 ^{**}	0.54	-0.14	0.09	-0.31	0.23	-0.883, 0.049
Control	-12.63 ^{***}	1.31	-12.99 ^{***}	1.28	1.49 [*]	0.69	0.48 ^{***}	0.10	0.71	0.41	0.021, 1.642	2.23 ^{**}	0.80	-0.16	0.08	-0.35	0.28	-1.159, 0.0003
Confidence	-9.50 ^{***}	0.93	-9.17 ^{***}	1.03	-3.60 ^{***}	0.46	0.0001	0.11	-0.0004	0.39	-0.789, 0.750	2.61 ^{***}	0.57	-0.13	0.09	-0.34	0.26	-0.964, 0.099

Note. *N* = 364. Regression coefficients are unstandardized. Significant indirect effects are printed in bold. IV = Independent Variable; ES =

Expressive Suppression; CR = Cognitive Reappraisal; MTQ48 = Mental Toughness Questionnaire 48; CUDOS = Clinically Useful Depression

Outcome Scale.

* *p* < .05. ** *p* < .01. *** *p* < .001.