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Original Citation

Mutz, Julian, Clough, Peter J. and Papageorgiou, Kostas A. (2017) Do Individual Differences in Emotion Regulation Mediate the Relationship Between Mental Toughness and Symptoms of Depression? *Journal of Individual Differences*, 38 (2). pp. 71-82. ISSN 1614-0001

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

Julian Mutz

King's College London

Peter Clough

Manchester Metropolitan University

Kostas A. Papageorgiou

Queen's University Belfast

Author Note

Julian Mutz, Department of Psychological Medicine, Institute of Psychiatry,
Psychology and Neuroscience, King's College London, United Kingdom; Peter Clough,
Department of Psychology, Manchester Metropolitan University; Kostas A. Papageorgiou,
School of Psychology, Queen's University Belfast.

Correspondence concerning this article should be addressed to Julian Mutz;

Email: julian.mutz@gmail.com; Phone: +44(0)7519262936

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?

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

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

15 **Mental Toughness**

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

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

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

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

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

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

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

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

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

77 **Mental Toughness and Emotion Regulation**

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

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

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

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

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

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

136 **Mental Toughness and Depression**

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

150 important role in understanding the relationship between MT and depressive symptoms.
151 Perhaps, mentally tough individuals cope with their emotions differently and resort on more
152 adaptive emotion regulation strategies, such as a more frequent use of cognitive reappraisal.
153 To date, no studies that have explored the role of emotion regulation strategies in explaining
154 the negative correlation between MT and depressive symptoms. This seems to be an
155 important area of investigation because understanding potential mediator variables could be
156 useful in developing more targeted interventions to counteract depressive symptoms.

157 **The Present Study**

158 Most previous studies on MT and depressive symptoms involved participants in
159 highly stressful environments, potentially at high risk for maladjustment (Wynaden,
160 Wichmann, & Murray, 2013). In order to test whether these findings can be generalized to a
161 broader range of people, the present study aims to extend previous research by investigating
162 how MT relates to depressive symptoms in a sample taken from the general population. This
163 is an important issue to address in order to determine whether or not MT is a useful concept
164 in the domain of mental health beyond groups of individuals in stressful environments. In
165 line with previous research, we hypothesized that: 1) MT is negatively correlated with
166 depressive symptoms; 2) individual differences in cognitive reappraisal are negatively
167 correlated with depressive symptoms; 3) individual differences in expressive suppression are
168 positively correlated with depressive symptoms. Since mentally tough individuals showed
169 fewer depressive symptoms in previous studies, we hypothesized that they differ in terms of
170 the strategies that they use to regulate their emotions. More specifically, we hypothesized
171 that: 4) MT is positively correlated with the habitual use of cognitive reappraisal; 5) MT is
172 negatively correlated with the habitual use of expressive suppression. Lastly, we tested a
173 statistical mediation model, which explores whether the relationship between MT and

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

176 **Method**

177 **Participants**

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

186 **Measures**

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

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

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

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

222 The Patient Health Questionnaire 9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001)
223 was used as an alternative instrument to measure the DSM-IV symptoms of major depressive
224 disorder, since – to the best of our knowledge – no studies have assessed the construct and
225 criterion validity of the CUDOS in the general population. It has an average completion time
226 of less than 2 minutes and assesses how often the respondent has experienced symptoms of
227 depression over the past two weeks. Responses to its nine items are given by assigning
228 values of 0 to 3 points (0 = *not at all*, 1 = *several days*, 2 = *more than half of the days*, and 3
229 = *nearly every day*). An overall score can be calculated by summing up the scores that were
230 reported for individual items of the questionnaire; higher scores indicate more symptoms of
231 depression. Example items include "Feeling down, depressed, or hopeless" and "Feeling
232 tired or having little energy". The PHQ-9 not only recognizes clinical depression but also
233 subthreshold levels of depressive symptoms in the general population (A. Martin, Rief,
234 Klaiberg, & Braehler, 2006). High internal consistency, test-retest reliability as well as
235 construct and criterion validity were demonstrated in a study by Bian, Li, Duan, and Wu
236 (2011).

237 **Procedure**

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

246 **Statistical Analysis**

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

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

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

277 **Results**

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

280

281 [Insert Table 1]

282

283 Table 2 presents partial correlations between the main study variables and reliability
284 estimates. As expected, the MTQ48 total index was negatively associated with both
285 measures of depressive symptoms (CUDOS $r = -.53, p < .001, 95\% \text{ CI } [-.60, -.44]$ and PHQ-
286 9 $r = -.49, p < .001, 95\% \text{ CI } [-.56, -.40]$). Cognitive reappraisal was negatively associated
287 with both the CUDOS and the PHQ-9 ($r = -.18, p < .001, 95\% \text{ CI } [-.29, -.06]$ and $r = -.19, p <$
288 $.001, 95\% \text{ CI } [-.30, -.08]$, respectively), whereas expressive suppression showed a positive
289 correlation with both measures of depressive symptoms (CUDOS $r = .18, p < .001, 95\% \text{ CI }$
290 $[.07, .29]$ and PHQ-9 $r = .19, p < .001, 95\% \text{ CI } [.08, .30]$). In line with our hypotheses, we
291 also found a positive correlation between MT and the use of cognitive reappraisal ($r = .26, p <$
292 $.001, 95\% \text{ CI } [.15, .36]$) and a negative correlation between MT and the use of expressive
293 suppression ($r = -.19, p < .001, 95\% \text{ CI } [-.29, -.09]$).

294

295 [Insert Table 2]

296

297 **Mediation Analysis**

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

312

313 [Insert Figure 1]

314

315 [Insert Table 3]

316

317 [Insert Table 4]

318

319

Discussion

320

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

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

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

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

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

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

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

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

397 Limitations

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

422 depressive symptoms. It has also been shown that MT relates to better sleep quality,
423 including fewer awakenings after sleep onset, less light sleep and more deep sleep (Brand et
424 al., 2014a; Brand et al., 2014b). Since sleep disturbance is a common characteristic of
425 depression and is predictive of recurrent depression (Roberts, Shema, Kaplan, & Strawbridge,
426 2014). As such, future research could explore whether mentally tough individuals show less
427 depressive symptoms due to better sleep quality.

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

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

448 **Conflict of interest**

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

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