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1 Article

2 Does Mental Wellbeing Protect Against Self-harm 3 Thoughts and Behaviours during Adolescence? A 4 Six-month Prospective Investigation

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11 **Abstract:** Mental wellbeing protects against the emergence of suicidal thoughts. However, it is not
12 clear whether these findings extend to self-harm thoughts and behaviours irrespective of intent
13 during adolescence, or why this relationship exists. The current study aimed to test predictions,
14 informed by the Integrated Motivational Volitional (IMV) model of suicide concerning the role of
15 perceived defeat and entrapment within the link between mental wellbeing and self-harm risk.
16 Young people ($n=573$) from secondary schools across Scotland completed an anonymous
17 self-report survey at two time points, six months apart, which assessed mental wellbeing, self-harm
18 thoughts and behaviours, depressive symptomology and feelings of defeat and entrapment.
19 Mental wellbeing was associated with reduced defeat and entrapment (internal and external) and a
20 decrease in the likelihood a young person would engage in self-harm thoughts and behaviours.
21 The relationship between mental wellbeing and thoughts of self-harm was mediated by a reduction
22 in perceptions of defeat and entrapment (internal and external). Mental wellbeing was indirectly
23 related to self-harm behaviours via decreased feelings of defeat and internal (but not external)
24 entrapment. Taken together, these findings provide novel insights into the psychological processes
25 linking mental wellbeing and self-harm risk and highlight the importance of incorporating the
26 promotion of mental wellbeing within future prevention and early intervention efforts.

27 **Keywords:** self-harm; adolescence; defeat; entrapment; mental well-being; IMV

28

29 1. Introduction

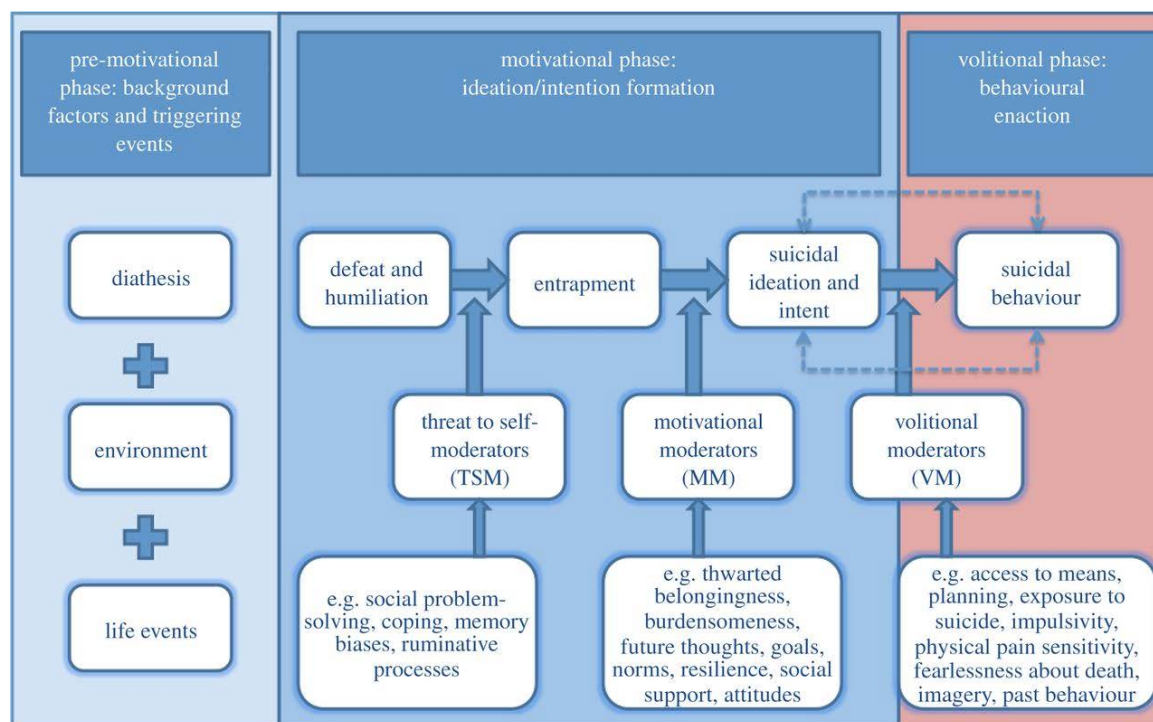
30 Self-harm, defined as “self-injury or self-poisoning irrespective of the apparent purpose of the
31 act” [1,2], first emerges as a significant public health problem during adolescence [3,4]. Evidence
32 suggests that an increasing number of young people are harming themselves [5]. This is concerning
33 as self-harm is indicative of intolerable psychological distress, and young people who harm
34 themselves are at significantly greater risk of suicide in the future (regardless of the intent
35 underpinning these acts) [6,7]. Responding effectively to self-harm is therefore a key target for
36 suicide prevention efforts. A fundamental component in reducing self-harm during adolescence is
37 the identification of factors that increase or protect against self-harm risk, and clarifying the
38 theoretical underpinnings of these relationships.

39 It is well established that self-harm is the end-product of a complex and multifaceted pathway
40 characterised by the interaction of biological, genetic, environmental and psychological factors [8,9].
41 Historically, most research investigating self-harm risk during adolescence has focused on factors
42 which are thought to increase the likelihood that a young person will think about or engage in
43 self-harm (i.e. risk factors) and research on protective factors has been more limited [4,9].

44 Furthermore, research examining factors that protect against self-harm risk is rarely conducted
 45 through the lens of psychological theory. Examining the potential role of the theoretically salient
 46 psychological factors that may underpin these relationships is necessary if we are to understand
 47 why these factors reduce self-harm risk in young people. Since risk and protective factors are more
 48 likely to occur in combination than in isolation, it has been recognised that there is a need to develop
 49 more sophisticated explanatory models of self-harm which can help to conceptualise the complex
 50 interplay between risk and protective factors [8,10-11]. Research of this nature will aid in the
 51 identification of possible intervention opportunities within the pathway to self-harm. One model
 52 that is well-placed to facilitate this work is the Integrated-Motivational-Volitional model [8,12].

53 *1.1. Integrated Motivational-Volitional Model of Suicidal Behaviour (IMV)*

54 The IMV is a tri-partite framework that maps out a clear pathway towards self-harm (Figure 1).
 55 Although the model was developed with suicidal behaviour in mind, it can be applied to any
 56 self-harm thoughts and behaviour (regardless of intent) [12-13]. The IMV describes how a multitude
 57 of factors interact and contribute to the development of self-harm thoughts (motivational phase), as
 58 well as to the transition from thoughts to acts of self-harm (volitional phase). At its core, the
 59 framework hypothesises that perceptions of defeat and entrapment are key drivers of the intention
 60 to self-harm. More specifically, the model hypothesises that when an individual perceives
 61 themselves to be trapped by internal and/or external factors in their life, they are more likely to
 62 develop self-harm thoughts. This intention to self-harm emerges because engaging in self-harmful
 63 behaviours is seen as the salient solution to escaping their thoughts, feelings and/or life
 64 circumstances. Feelings of entrapment are thought to be triggered by perceptions of
 65 defeat/humiliation, which are often associated with a range of background and triggering factors
 66 including stress (within the pre-motivational phase). The transition from defeat to entrapment is not
 67 inevitable and the likelihood of this progression can be facilitated or obstructed depending on the
 68 presence of factors known as threat-to-self moderators. Similarly the transition from entrapment to
 69 self-harm thoughts can be strengthened or attenuated in the presence or absence of motivational
 70 moderators.



71
 72 **Figure 1.** A visual representation of the Integrated Motivation-Volitional Model of Suicidal
 73 Behaviour (IMV) [8,12].

74 There is growing empirical support for the pathways and processes described in the IMV
75 [12-13]. A substantial body of evidence supports the hypothesised role of defeat and entrapment as
76 part of the psychological pathways that give rise to self-harm [14-17], and for the influence of
77 threat-to-self and motivational moderators. Whilst the IMV model provides one of the most
78 comprehensive accounts to date of the processes involved in the development of self-harm thoughts
79 and behaviours, it is still relatively new and, therefore, not exhaustive. Further, few studies have
80 investigated the hypothesised pathways of the IMV in young people, despite adolescents being a
81 high risk group [18-20]. Identifying the factors which are associated with reduced risk of self-harm in
82 young people, and why, is key to understanding and preventing self-harm in this population [6,21].
83 As a result, there is a need to investigate the role of novel and modifiable protective factors within
84 the context of the IMV. Mental wellbeing has received increasing international interest in recent
85 years and is a likely, potential candidate in this regard. However, its potential application to
86 self-harm risk is not yet fully understood.

87 *1.2. Mental Wellbeing During Adolescence*

88 The World Health Organisation [22] (p. 12) defines mental health as: ‘a state of wellbeing in
89 which every individual realises his or her own potential, can cope with the normal stresses of life,
90 can work productively and fruitfully, and is able to make a contribution to her or his community.’
91 This definition recognises that mental health goes beyond a simple absence of mental illness. Mental
92 wellbeing is a broad and complex construct that comprises two dimensions, namely how we feel
93 (hedonic) and how we function psychologically and socially (eudemonic) [23-25]. It is the
94 combination of these aspects that contribute to a young person being mentally healthy (i.e., feeling
95 good and functioning well) [26-27]. Greater mental wellbeing appears to protect against a range of
96 negative health, social, and psychological outcomes [27-29]. Due to growing awareness of its public
97 health impact the promotion of mental wellbeing during adolescence is becoming an international
98 priority [30,31].

99 *1.3. Does Increased Mental Wellbeing Protect Against Self-harm Risk During Adolescence?*

100 Whilst research has demonstrated that mental wellbeing protects against the development and
101 maintenance of subsequent suicidal ideation in adults [32-34], it remains to be seen whether these
102 prospective findings extend to adolescents. To our knowledge, only one study has investigated the
103 relationship between mental wellbeing and self-harm risk in adolescents. Morey et al. [35] reported
104 that adolescents with a history of self-harm were more likely to report lower levels of mental
105 wellbeing. However, since that study was cross-sectional, prospective research is necessary to clarify
106 the nature of the relationship and if mental wellbeing protects against self-harm risk more broadly
107 (i.e., irrespective of intent) over time. In addition, the psychological processes driving the link
108 between mental wellbeing and self-harm risk during adolescence are not known. Understanding
109 these will be critical for developing effective and empirically-informed interventions. As a result,
110 there is a need to investigate the link within the context of self-harm theory. Whilst mental wellbeing
111 is not specifically highlighted within the IMV model, it may be hypothesised that it presents a
112 potentially modifiable factor within different areas of this theoretical framework. Preliminary
113 evidence suggests that mental wellbeing buffers the impact of entrapment on suicidal ideation in
114 adults, thereby qualifying it as a motivational moderator based on the assertions of the IMV [36].
115 Given that adolescence is a high risk developmental period for the onset and maintenance of
116 self-harm, it is important that investigations seek to establish whether these findings extend to
117 young people.

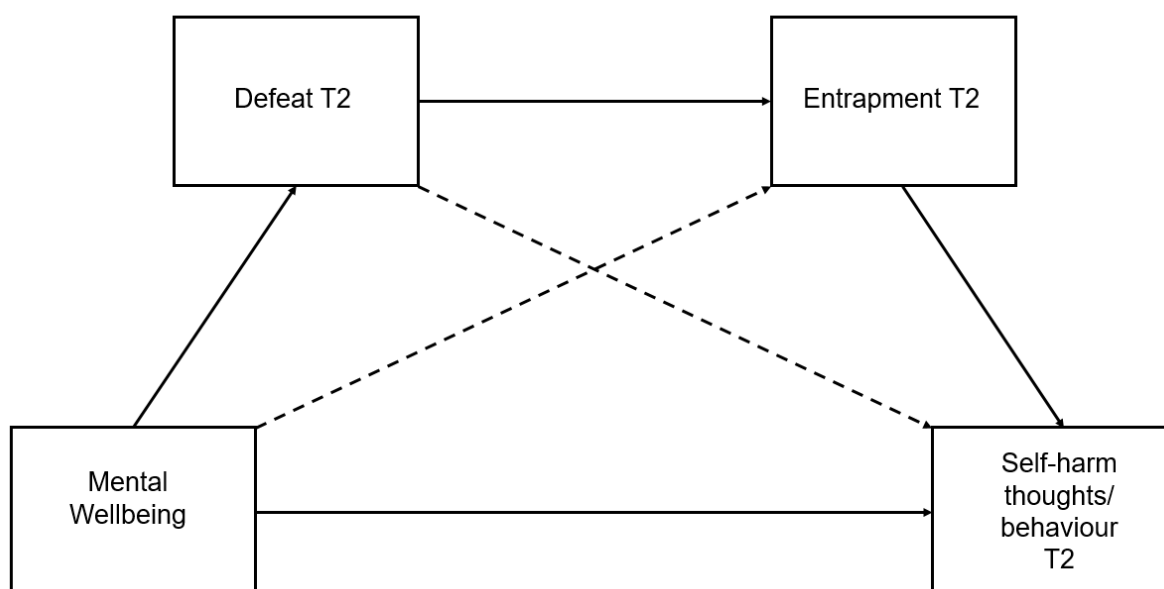
118 Within the first phase of the IMV (the pre-motivational phase) it is proposed that individuals
119 may possess pre-existing vulnerability factors that pre-dispose them to respond adversely to
120 stressors. The interaction between background factors and stressful circumstances is hypothesised to
121 increase the likelihood that the individual will develop self-harmful thoughts via increased
122 perceptions of defeat and entrapment within the motivational phase [12]). Mental wellbeing has
123 been shown to interact with stressful life events, such that those with higher levels of mental

124 wellbeing are less likely to develop suicidal ideation in response to elevated levels of stress [37]. As a
 125 result, it is possible that greater mental wellbeing may protect against risk of intentional self-injury
 126 and self-poisoning in young people by reducing perceptions of defeat and entrapment, and
 127 buffering against the emergence of one's intention to self-harm. It could therefore be hypothesised
 128 that mental wellbeing may fit as a pre-existing background *protective* factor within the
 129 pre-motivational phase. Given that depression (a disorder characterised by depressed mood and a
 130 loss of interest and/or pleasure) is associated with poorer mental wellbeing and increased risk of
 131 self-harm thoughts and behaviours [29], it is important to account for the influence of young
 132 people's experiences of depressive symptoms when examining the role of mental wellbeing in
 133 self-harmful pathways.

134 1.4. The Current Study

135 A limited body of research has investigated the link between mental wellbeing and self-harm
 136 risk. Clarifying the extent and nature of the interactions among these psychological factors may be
 137 important for future advances in self-harm intervention and prevention science. Therefore, the aims
 138 of the current study were fourfold:

- 139 1. To examine whether mental wellbeing protects against subsequent self-harm thoughts and
 140 behaviours.
- 141 2. To determine if mental wellbeing is associated with subsequent perceptions of defeat, internal
 142 entrapment, and external entrapment.
- 143 3. To test hypothesised multi-step pathways derived from the IMV which link mental wellbeing
 144 (as a potential pre-motivational factor) and prospective self-harm thoughts and behaviours, via
 145 perceptions of defeat and entrapment (Figure 2).
- 146 4. To establish whether mental wellbeing moderates the relationship between entrapment and
 147 prospective self-harm thoughts.



148

149 **Figure 2.** Predicted serial multiple mediation pathway (highlighted in non-dashed lines) for
 150 association between mental wellbeing and subsequent self-harm thoughts, via defeat and
 151 entrapment. Predicted multiple mediation pathway highlighted in non-dashed lines. "T2" indicates
 152 that data was collected at the second time-point.

153 Four hypotheses were generated. First, based on the findings of previous cross-sectional
 154 research, it was hypothesised that mental wellbeing would be negatively associated with self-harm

155 thoughts or behaviours during the six month follow up period. Second, it was expected that mental
156 wellbeing would be negatively associated with the three motivational factors (defeat, internal
157 entrapment, and external entrapment). We investigated both internal and external entrapment
158 because recent work suggests that entrapment is best conceptualised as bidimensional and that each
159 accounts for unique variance in adjustment indices [38-39]. Third, it was hypothesised that the
160 prospective association between mental wellbeing and one's intention to engage in self-harm would
161 operate via a multi-stage indirect pathway. Specifically, it was predicted that mental wellbeing
162 would be negatively associated with defeat; that defeat would in turn be positively associated with
163 perceptions of entrapment (internal and external); and that entrapment would be positively related
164 to thinking self-harm thoughts and behaviours. Fourth, it was predicted that mental wellbeing
165 would moderate the relationship between adolescents' perceptions of entrapment and prospective
166 self-harm thoughts.

167 2. Materials and Methods

168 2.1. Participants

169 At baseline (T1: June 2015), we recruited 1045 adolescents (52.8% female) from 21 mainstream
170 schools across Scotland. We requested permission from all local education authorities (n=32) to
171 contact their secondary schools and invite them to participate in the current study. Where approval
172 was granted (n=8), all mainstream schools within that authority were contacted. We recruited 28% of
173 the target schools to this study. This is consistent with previous research investigating self-harm in
174 adolescents [40]. Ages ranged from 15-17 years (M=15.35, SD=0.68). In terms of ethnicity, 97.2% of
175 the sample was White. This is in line with the most recent Scottish Census data (2011). There was
176 representation from both urban (n=16) and rural (n=5) schools.

177 Of the initial sample, 54.8% (n=573) completed measures at both time points and all analyses
178 were constrained to this subsample. Reasons for non-participation at 6-month follow up (T2)
179 included absence due to sickness or holidays, engagement in alternative activities, and truancy
180 (n=305). Further, one school withdrew their participation between T1 and T2 (n=167). Using t-tests
181 and chi-squared tests, it was determined that those who completed the measures at 6-month follow
182 up were similar to those who did not in terms of gender, mental well-being, and self-harm thoughts
183 (all $ps > 0.05$). However, adolescents who did not complete measures at T2 reported more depressive
184 symptoms at T1 ($t(1045) = 3.70, p < 0.001, \text{Cohen's } d = 0.02$) and were more likely to have a history of
185 engaging in self-harm behaviour ($X^2(1) = 5.65, p = .018, \text{Phi} = .02$). These differences were small in
186 magnitude.

187 2.2. Measures

188 **Demographic factors.** Information on age, gender and ethnicity was collected in order to
189 characterise the study sample.

190 **Mental Wellbeing.** The Short Version Warwick-Edinburgh Mental Wellbeing Scale
191 (SWEMWBS) [25] comprises 7 positively worded items that relate to different aspects of positive
192 mental health. The scale has five response categories ranging from 1 ("none of the time") to 5 ("all of
193 the time"). Higher scores indicate more positive mental well-being. The measure's validity and
194 reliability have been established in diverse populations, including secondary school pupils in the UK
195 (aged 13 to 16) [41]. Mental wellbeing data were collected at both time points. Internal consistency
196 was shown to be good in the current sample (T1: $\alpha = 0.87$).

197 **Depressive symptomology.** The 7-item depression subscale of the Hospital Anxiety and
198 Depression Scale (HADS) [42] is a valid and reliable measure of depressive symptomology, which is
199 frequently used in community settings [19,43-44]. Participants are asked to indicate the extent to
200 which they have experienced depressive symptoms in the past week on a Likert scale ranging from
201 0-3, and total scores are calculated by taking a sum of all responses. Data on depressive
202 symptomology were collected at both time points. This measure has been validated for use in
203 adolescent samples and internal consistency was shown to be good in the present sample (T1:

204 $\alpha=0.86$). Research has demonstrated that both mental wellbeing and self-harm are linked to
205 depression. As a result, the HADS was included in the current study so that severity of depression
206 could be adjusted for within our statistical analyses.

207 **Thoughts of self-harm.** History of self-harm thoughts was assessed using a single item,
208 "Have you ever thought about taking an overdose or trying to harm yourself but not actually done
209 so?" Participants were asked to provide a binary response (yes/no). This measure has been used to
210 assess self-harm thoughts in a range of school-based surveys across Europe [45-47]. At T2,
211 participants were asked to respond to the same item but were instructed to consider only the period
212 that had elapsed since completing the T1 survey. As such, we were able to determine whether
213 respondents had thought about self-harm, for the first time ever, during the period between T1 and
214 T2.

215 **Self-harm behaviour.** Acts of self-harm were assessed using one question taken from the Child
216 and Adolescent Self-harm in Europe (CASE) survey [45]. Adolescents were initially asked if they
217 had ever deliberately taken an overdose (e.g., of pills or other medication) or tried to harm
218 themselves in some other way (e.g., cutting themselves). Those who reported having engaged in
219 self-harm were asked to think about their last act of self-harm and to describe in their own words (in
220 as much detail as they felt comfortable with) how they had harmed themselves on that occasion. We
221 asked young people to provide a description of their most recent experience of self-harm so that we
222 were able to determine whether they met the CASE definition of self-harm: "an act with a non-fatal
223 outcome in which an individual deliberately did one or more of the following: initiated behaviour
224 (e.g., self-cutting, jumping from a height), which they intended to cause self-harm; ingested a
225 substance in excess of the prescribed or generally recognised therapeutic dose; ingested a
226 recreational or illicit drug that was an act the person regarded as self-harm; ingested a non-ingestible
227 substance or object" [45] (p. 28). Participants were asked about their history of self-harm at baseline
228 (T1). During the follow up (T2) assessment (six months later) they were asked if they had engaged in
229 self-harm since participating in the first survey. As a result, we were able to establish if adolescents
230 had intentionally harmed themselves during the follow up period.

231 2.3. Procedure

232 Ethical approval was obtained from the University Ethics Committee (UEC16/47) at the lead
233 author's institution. Once permission had been received from a hierarchy of gatekeepers (i.e. local
234 education authorities, school gatekeepers, and parents/guardians), young people were invited to
235 take part in the study. All participants provided informed consent and pupils were aware of their
236 right to withdraw their participation.

237 Respondents completed an anonymous self-report survey at two time-points, six-months apart
238 within a school setting. In order to reinforce the private and confidential nature of the survey, young
239 people answered questions under exam conditions (i.e. independently and in silence), the order of
240 questions was counterbalanced, and participants sealed their completed questionnaires in an
241 envelope before being returned to the researcher. Respondents generated a six digit unique
242 reference code by completing a series of questions that required alphanumeric responses at both
243 time points. This allowed the research team to match response at follow up, whilst maintaining the
244 anonymity of the pupils that were participating. All young people were debriefed and provided
245 with an information sheet that contained contact details for a range of local physical and mental
246 health support services. Participants received no incentive for completing the survey

247 2.4. Data analytic strategy

248
249
250 IBM SPSS Statistics 25 for Windows (IBM Corp, Armonk, NY, USA) was used to conduct all
251 statistical analyses. Inspection of histograms revealed skewness across all independent variables.
252 Accordingly, medians and interquartile ranges were calculated. Initially, Spearman correlational
253 analyses were conducted to allow for a preliminary examination of the relationships between all
254 variables assessed in the study. Given that self-harm engagement groups (self-harm thoughts vs. no

255 self-harm thoughts and self-harm behaviours vs. no self-harm behaviour) were unequal and that the
256 assumption of homogeneity was violated for depressive symptomology, bootstrapping was applied
257 to all analyses. Bootstrapping is a non-parametric re-sampling technique in which repeated samples
258 are taken from the original dataset to estimate the sampling distribution of a statistic. In this study,
259 analyses were based on 5000 sample bootstrap replications.

260 To address the first aim of the current investigation two binary logistic regressions were
261 conducted to determine whether mental wellbeing predicts subsequent self-harm thoughts and/or
262 self-harm behaviour. The reference category for these analyses were young people who had not
263 thought about harming themselves and young people who had not harmed themselves during the
264 six-month follow up period respectively.

265 To determine whether mental wellbeing is associated with motivational factors within the IMV,
266 a series of three multivariate regressions were conducted. The outcome variables for each of these
267 analyses were defeat, internal entrapment, and external entrapment. All outcome variables were
268 assessed at T2.

269 Next, a serial multiple mediation pathway was tested using model 6 of the PROCESS algorithm
270 for SPSS [48] whereby the relationship between mental wellbeing and prospective self-harm
271 thoughts was mediated by perceptions of defeat and entrapment at T2. Two separate mediational
272 models were ran. In the first model, the predictor variable was mental wellbeing, the mediator
273 variables were perceived defeat and internal entrapment, and the outcome variable was self-harm
274 thoughts. The analysis controlled for gender and the presence of depressive symptomology on both
275 the outcomes and mediators. This analysis was repeated, replacing internal entrapment with
276 external entrapment. As both subtypes of entrapment are highly correlated, where internal
277 entrapment was entered as a mediator we included external entrapment as a covariate and vice
278 versa. Direct and indirect effects were calculated for both models. Given that PROCESS expects
279 complete data on all variables included in the model, and that 7 participants (1.3%) had missing
280 data, these analyses were conducted using 98.7% ($n=566$) of the included sample. Missing data were
281 handled using listwise deletion. Given that gender and severity of depressive symptomology have
282 been shown to be robust predictors of self-harm, these were included as covariates within all
283 analyses. As were history of self-harm thoughts and behaviours (reported at baseline).

284 Finally, using model 1 in PROCESS, a moderation model was tested whereby mental wellbeing
285 at T1 moderates the relationship between entrapment (internal and external) at baseline and
286 prospective self-harm thoughts. As with the previous analyses, when investigating one subscale of
287 entrapment as a predictor, the other was included as a covariate, alongside depression and gender.
288 Whilst data were collected from individual pupils who were nested within their respective schools,
289 it was determined that multilevel modelling analysis would not yield different results from
290 non-multilevel techniques. This decision was supported by the fact that participants' school did not
291 significantly predict self-harm and that intra-class correlation coefficients suggested that there was
292 no relationship between observations within schools.

293 3. Results

294 3.1. Preliminary Results

295 Of the young people who took part at baseline, 28.5% ($n=298$) endorsed having ever thought
296 about harming themselves. Within this subgroup, 37.6% ($n=112$) had thought about engaging in
297 self-harm but had never acted on those thoughts, whilst 62.4% ($n=186$) reported that their thoughts
298 had progressed to actions. Of the adolescents who completed the survey at both time points, 16.2%
299 ($n=92$) had thought about self-harm during the six-month follow up period. All of these young
300 people had reported a lifetime history of self-harm thoughts at T1. Exactly 50% ($n=46$) of the
301 adolescents who had considered harming themselves during the prospective period had acted on
302 these thoughts. Of the young people who took part at baseline, 17.8% ($n=186$) endorsed having ever
303 engaged in self-harm. Of the adolescents who completed self-harm measures at both time points,
304 8.1% ($n=46$) reported having engaged in self-harm during the six-month follow up period. The

305 majority (67.3%) of these young people described repetition of self-harm since T1, whilst the
306 remaining 32.7% endorsed having engaged in self-harm for the first time between baseline and
307 follow up. Descriptive statistics (for all continuous variables) and correlational analyses (for all
308 study variables) are presented in Table 1. The relationships between mental wellbeing and all other
309 study variables were negative (all $ps < .001$). Associations between depressive symptomology,
310 defeat, internal entrapment, external entrapment, self-harm thoughts and self-harm behaviours
311 were positive and statistically significant (all $ps < .001$).
312

313 **Table 1.** Means, standard deviations and Spearman correlational coefficients for mental wellbeing,
 314 depression, defeat, internal entrapment, external entrapment and self-harm thoughts and
 315 behaviours.

	1	2	3	4	5	6	7
1. Mental wellbeing							
2. Depressive symptoms	-.51***						
3. Defeat	-.52***	.41***					
4. Internal Entrapment	-.42***	.38***	.78***				
5. External Entrapment	-.37***	.34***	.76***	.84***			
6. SHT T2	-.27***	.19***	.42***	.45***	.43***		
7. SHB T2	-.16***	.11**	.32***	.35***	.34***	.67***	
<i>Median</i>	22.85	3.00	12.00	1.50	2.00	-	-
<i>Interquartile range</i>	5.78	4.00	17.00	6.00	7.00	-	-

316 Note: Variables 2 to 7 within the correlation matrix were collected at the 6 month follow up, SHT T2 =
 317 Self-Harm Thoughts during 6 month follow up. ***p < .001, **p < .01. Where variables are
 318 dichotomous the symbol (-) indicated that it was not possible to calculate a median and interquartile
 319 range.

320 3.2. Does Mental wellbeing Protect Against Subsequent Self-harm Thoughts and Behaviours?

321 Two logistic regression tests were applied to address the first aim of the study. Descriptive
 322 statistics demonstrated the perceptions of mental wellbeing were higher in those who had not
 323 thought about self-harm or engaged in self-harm during the follow up period. The results of these
 324 logistic regressions demonstrated that young people who reported greater mental wellbeing at T1
 325 were less likely report having thought about harming themselves (OR: .876, 95% CI: .820,.936, p <
 326 .001) or engaging in self-harm (OR: .913, 95% CI: .838,.995, p = .032) during the subsequent six month
 327 period.

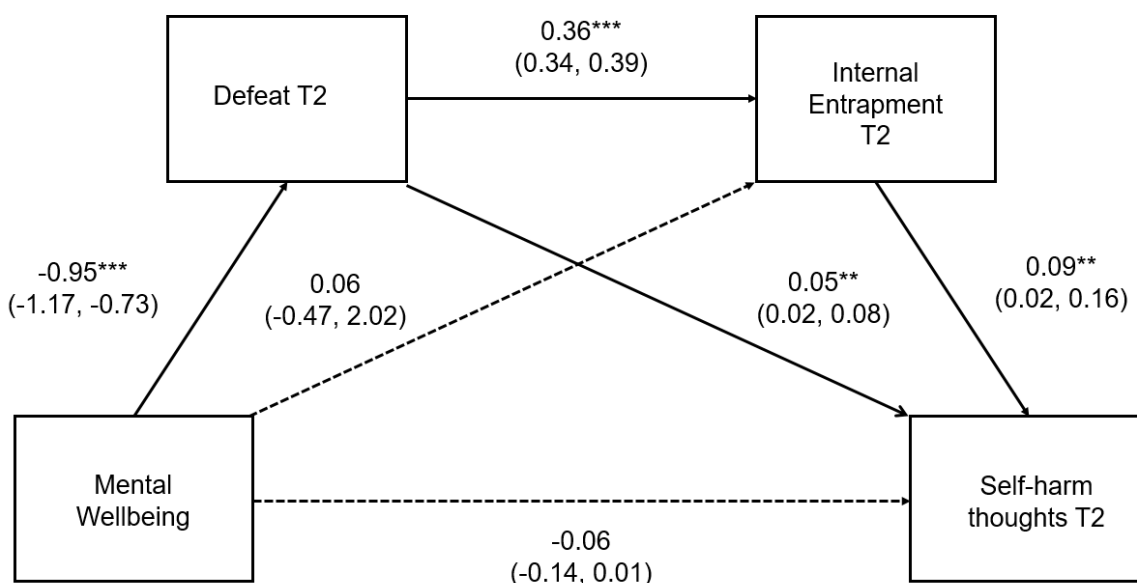
328 3.3. Is Mental Wellbeing Associated with Reduced Perceptions of Defeat and Entrapment?

329 A linear regression was applied to test the associations between positive wellbeing and each
 330 mediator (defeat, internal entrapment, and external entrapment), resulting in three regressions in
 331 total. As both gender and depressive symptoms were found to predicted perceptions of defeat,
 332 internal entrapment and external entrapment (all ps < .001), they were included as covariates in all
 333 regression models. Consistent with the second hypothesis, there was a significant negative
 334 association between mental wellbeing scores at T1 and participants' perceptions defeat at T2 (R2=
 335 .21, .001; $\beta = -.20$, (p < .001), and external entrapment at T2 (R2= .15, F(2, 566) = 50.02, p < .001; $\beta = -.19$,
 336 p < .001). These relationships were independent of both covariates.

337 3.4. Do perceptions of defeat and entrapment mediate the relationship between mental wellbeing and 338 subsequent self-harm thoughts and behaviour?

339 The direct pathways between positive mental wellbeing, defeat, internal entrapment, and
 340 self-harm thoughts and behaviours, controlling for gender, depression, and external entrapment, are
 341 presented in Figure 3 and 4 respectively. Where the outcome was self-harm behaviours, prospective
 342 thoughts of self-harm were included as a covariate. Unstandardised point estimates and
 343 bootstrapped 95% CIs for the total indirect effect and three specific indirect pathways are provided
 344 in Table S1 and Table S2, which can be found in the supplementary materials.

345



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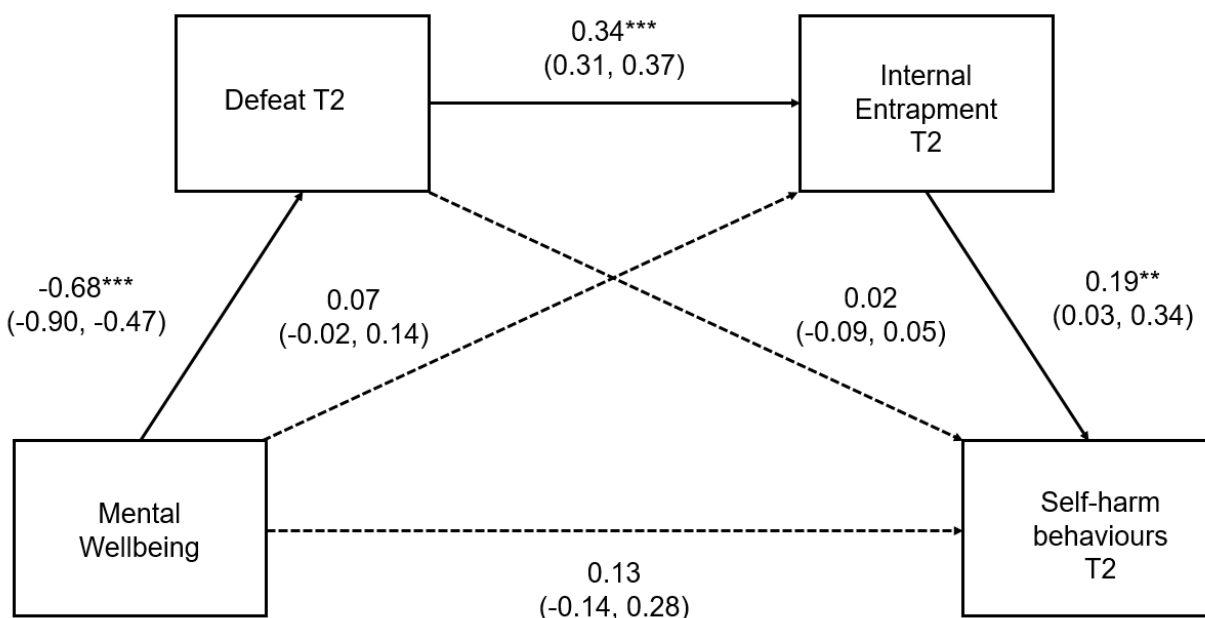
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Figure 3. Serial multiple mediation model for the association between mental wellbeing and prospective self-harm thoughts, via defeat and internal entrapment. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Serial multiple mediation model with unstandardized regression coefficients and 95% bias corrected confidence intervals. Significant pathways are highlighted in bold.

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Figure 4. Serial multiple mediation model for the association between mental wellbeing and prospective self-harm behaviours, via defeat and internal entrapment. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Serial multiple mediation model with unstandardized regression coefficients and 95% bias corrected confidence intervals. Significant pathways are highlighted in bold.

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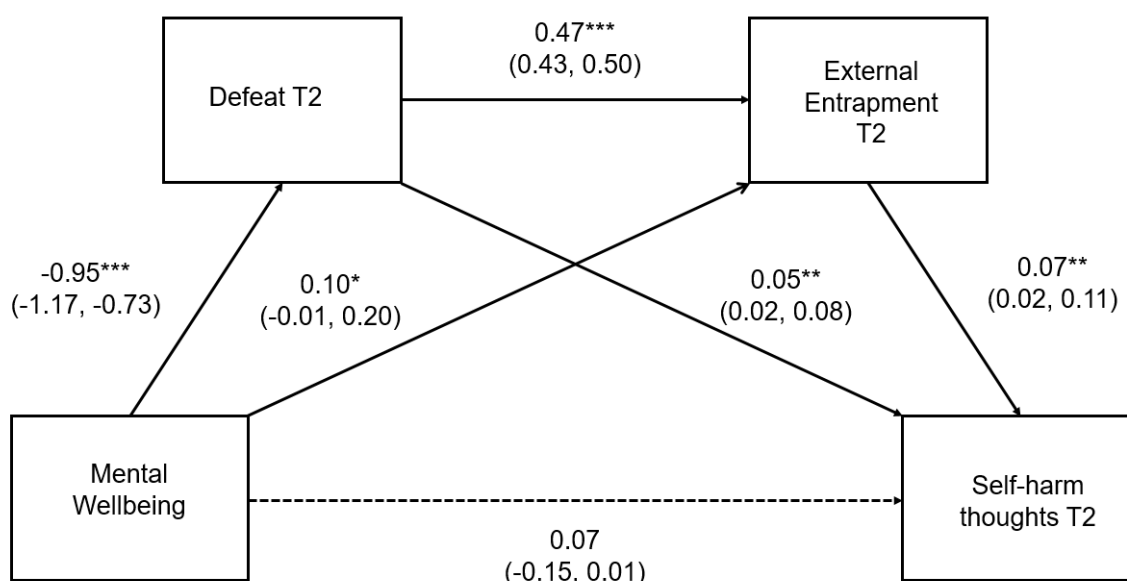
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Mental wellbeing was significantly associated with prospective self-harm thoughts and behaviours indirectly through defeat and internal entrapment assessed at T2. Perceptions of mental wellbeing, defeat and internal entrapment explained a moderate amount of the variability in the

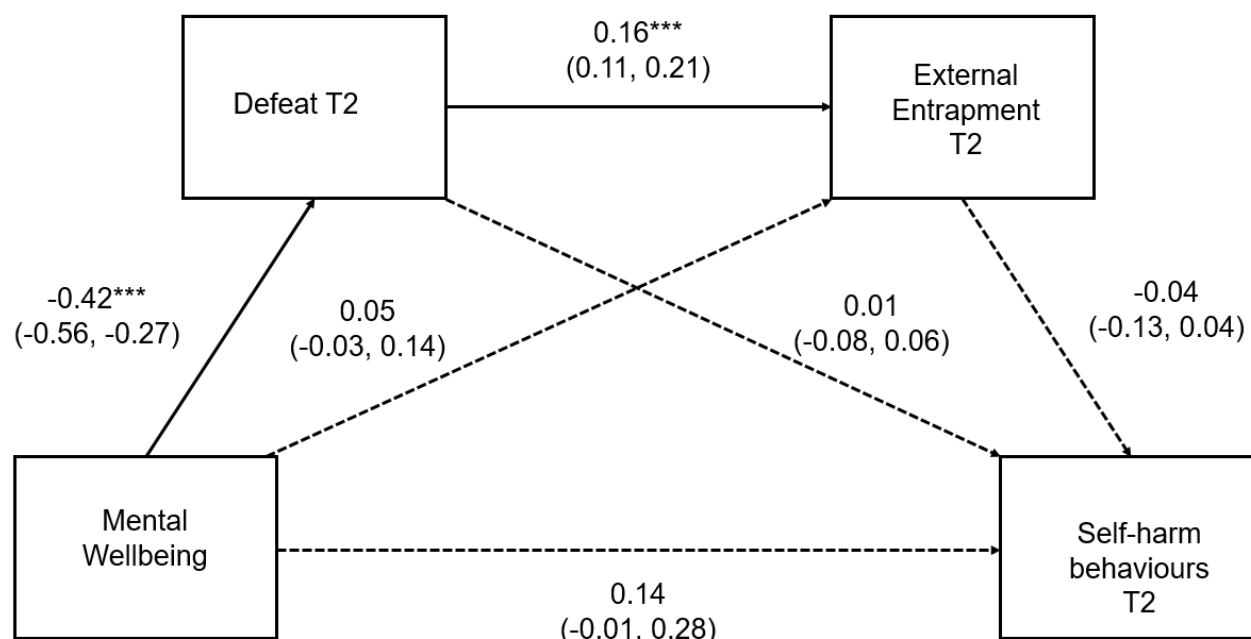
360 likelihood of reporting self-harm thoughts (Pseudo R²; Cox and Snell = .20, Nagelkerke = .35;
 361 McFadden = .26) and behaviours (Pseudo R²; Cox and Snell = .33, Nagelkerke = .74; McFadden = .68.
 362 Mental wellbeing did not maintain a significant direct relationship (p = .075) with future self-harm
 363 thoughts or behaviours (p = .063) within the full mediational model, demonstrating that reduced
 364 perceptions of defeat and internal entrapment account for the negative association between mental
 365 wellbeing and prospective self-harm thoughts and behaviours.

366 The direct pathways between mental wellbeing, defeat, external entrapment, and self-harm
 367 thoughts and behaviours, controlling for gender and depression, are presented in Figure 5 and 6
 368 respectively. Where the outcome was self-harm behaviours, prospective thoughts of self-harm were
 369 included as a covariate. Unstandardised point estimates and bootstrapped 95% CIs for the total
 370 indirect effect and three specific indirect pathways are provided in Table S4 and S5, which can be
 371 found in the supplementary materials.



372

373 **Figure 5.** Serial multiple mediation model for the association between mental wellbeing and
 374 prospective self-harm thoughts, via defeat and external entrapment *p<0.05, **p<0.01, ***p<0.001
 375 Serial multiple mediation model with unstandardized regression coefficients and 95% bias corrected
 376 confidence intervals. Significant pathways are highlighted in bold.



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Figure 6. Serial multiple mediation model for the association between mental wellbeing and prospective self-harm behaviours, via defeat and external entrapment. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Serial multiple mediation model with unstandardized regression coefficients and 95% bias corrected confidence intervals. Significant pathways are highlighted in bold.

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Positive mental wellbeing was significantly associated with subsequent self-harm thoughts indirectly through defeat and external entrapment assessed at T2. Mental wellbeing, defeat and external entrapment explained a moderate amount of the variability in the likelihood of reporting self-harm thoughts (Pseudo R^2 ; Cox and Snell = .21, Nagelkerke = .35; McFadden = .26). Mental wellbeing did not maintain a significant direct relationship ($p = .052$) with future self-harm thoughts within the full mediational model, demonstrating that reduced perceptions of defeat and external entrapment account for the negative association between mental wellbeing and prospective thoughts of self-harm.

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The hypothesised serial multiple mediation model from mental wellbeing to prospective self-harm behaviours via defeat and external entrapment, was not statistically significant ($\beta = .001$, 95% CI: -0.064, .155) when adjusting for gender, depressive symptomology, internal entrapment, and self-harm thoughts assessed at T2. This model is significant when it does not control for prospective self-harm thoughts. Further examination of individual pathways suggest that prospective self-harm may fully mediate the relationship between entrapment and subsequent self-harm behaviours.

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3.5. Does mental wellbeing moderate the relationship between entrapment and prospective self-harm thoughts?

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The overall model was not statistically significant for both internal ($p = .482$) and external entrapment ($p = .493$). These results suggest that mental wellbeing does not moderate the relationship between the internal/external entrapment and subsequent self-harm thought. The statistical estimates for the individual paths characterising this model are provided in Table S5 and S6, which can be found within the supplementary materials.

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4. Discussion

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The current study is the first to investigate the relationship between mental wellbeing and both self-harm thoughts and behaviours using a prospective research design. In addition, it is the first to test predictions derived from the IMV in order to advance understanding regarding the psychological mechanisms underpinning this link. The aims of this investigation were fourfold. First, we sought to examine whether mental wellbeing protects against future self-harm thoughts

408 and behaviours. Second, we set out to determine if mental wellbeing was associated with
409 perceptions of defeat and both internal and external entrapment. Third, we wished to test
410 hypothesised multi-step pathways linking mental wellbeing and self-harm thoughts and
411 behaviours, via perceptions of defeat and entrapment (internal and/or external). Fourth, we wished
412 to determine if mental wellbeing moderated the relationship between entrapment and subsequent
413 self-harm thoughts.

414 *4.1. Mental wellbeing in relation to subsequent self-harm thoughts and behaviours*

415 The current study extends the literature by examining mental wellbeing in relation to future
416 self-harm thoughts and acts of self-harm during adolescence. Results demonstrated that young
417 people with better mental wellbeing were less likely to report thinking about or engaging in
418 self-harm during the six-month follow up period. Importantly, these relationships persisted when
419 controlling for gender and depressive symptomology. The findings thus support our hypothesis and
420 are in line with cross-sectional research investigating this link in young people in the UK [35].

421 *4.2. Mechanisms linking mental wellbeing and self-harm risk: The role of defeat and entrapment*

422 Defeat and entrapment are robust and proximal predictors of self-harm. Our results highlight
423 that young people with better mental wellbeing are more likely to report lower perceptions of
424 subsequent defeat and entrapment. These findings support our second hypothesis and are consistent
425 across both entrapment subscales (i.e. internal and external). This is the first study to investigate
426 these self-harm related constructs in relation to mental wellbeing. Following on from that, the
427 current study supports the hypothesised multi-step mediational pathway from mental wellbeing to
428 self-harm thoughts. Specifically, young people who report better mental wellbeing are less likely to
429 feel defeated, as a result of reduced defeat these younger people are less likely to feel trapped (either
430 by their own thoughts and feelings or by their life circumstances). Reduced perceptions of
431 entrapment are then associated with a reduced likelihood of thinking about self-harm in the future.
432 Our work offers novel insights regarding the link between mental wellbeing and self-harm thoughts
433 and reinforce the importance of defeat and entrapment as potentially transdiagnostic psychological
434 constructs underlying self-harm thoughts and behaviours [49-52]. This is particularly interesting as
435 no research has scientifically tested the relationship between mental wellbeing and defeat and
436 entrapment in young people. These findings suggest that enhancing protective factors such as
437 mental wellbeing may reduce young people's experience of proximal risk factors for self-harm.

438 It is important to note that the negative relationship between mental wellbeing and internal
439 entrapment was fully mediated by reduced perceptions of defeat, whilst lower levels of defeat only
440 partially accounted for the link between mental wellbeing and reduced external entrapment. This
441 suggests that additional pathways may underlie the latter relationship and that future research
442 should focus on identifying these other candidate mechanisms. Further, these findings reinforce the
443 value of looking at separate subscales of entrapment with regards to obtaining a refined
444 understanding of how self-harm risk can be prevented or reduced in young people [39].

445 The current study supports the hypothesised multi-step mediational pathway from mental
446 wellbeing to self-harm behaviours via defeat and internal entrapment when controlling for the
447 experience of prospective thoughts of self-harm. Conversely our findings did not support the
448 hypothesised multi-step model from mental wellbeing to self-harm behaviours via defeat and
449 external entrapment. Further examination of the individual pathways supported a link between
450 mental wellbeing and defeat, and the relationship between defeat and external entrapment. The
451 perception of feeling trapped by life circumstances (i.e., external entrapment) mediates the link
452 between defeat and self-harm behaviours when prospective self-harm thoughts is not included as a
453 covariate, but disappears when this variable is adjusted for. Taken together, these findings suggest
454 that subsequent thoughts of self-harm, assessed at follow up, may mediate the relationship between
455 external entrapment and prospective acts of self-harm. Whilst it would have been advantageous to
456 confirm this by examining the hypothesised model in full (i.e. mental wellbeing > defeat >
457 entrapment > self-harm thoughts > self-harm behaviours) available software does not

458 currently support the inclusion and testing of binary mediators within serial multiple mediation
459 models. This is a limitation of our work and future research should seek to examine this pathway.

460 4.3. *Establishing the nature of the link between mental wellbeing and defeat*

461 Within the current investigation, experiencing better mental wellbeing was strongly related to
462 reduced perceptions of defeat. However, it is not yet clear why this is the case. As a result, research
463 which seeks to uncover the nature of this link is warranted. What we do know is that mental
464 wellbeing affords resilience to stressful events [53]. People who are characterised as being resilient
465 are able to effectively cope with heightened stress and positively adapt to situations despite their
466 experiences of significant adversity or trauma [54]. However, resilience does not eradicate stress or
467 remove life adversities, instead it gives people the tools to handle problems effectively and
468 overcome adversity [55]. As such, mental wellbeing may increase young people's resilience and act
469 as a buffer against the impact of stress by providing young people with the resources to "bounce
470 back" from difficult experiences [56]. These resources may come from feeling good and functioning
471 well at the individual level (e.g. optimism and the ability to think clearly) or in affiliation with others
472 by forming strong and supportive interpersonal relationships. In turn, these young people may feel
473 less defeated in response to stressful circumstances. Future research could look at the aspects of
474 mental wellbeing (e.g. optimism, feeling useful, feeling close to others) that are most influential
475 within this context.

476 4.4. *Mental wellbeing as a moderator of the relationship between entrapment and self-harm thoughts*

477 Contrary to our hypothesis and preliminary evidence in adults, our findings demonstrate that
478 mental wellbeing did not moderate the relationship between entrapment (internal and external) and
479 self-harmful thoughts as has been found elsewhere in the literature [34]. Several methodological
480 differences between the current investigation and the work of Teisman et al. [34] may explain these
481 different findings. First, our sample comprised young people in the community, whilst previous
482 work focused on a substantially wider age range (18-77 years old). Adolescence is a unique
483 developmental period and so it may be that this finding does not apply to young people. Second, we
484 focused on self-harm more broadly, whilst the previous investigation assessed thoughts specifically
485 associated with suicidal intent. Third, our research was prospective and so it may be that these
486 findings only apply cross-sectionally. Fourth, there were differences in measurement of mental
487 wellbeing between the current investigation and the work of Teisman et al. [34]. Whilst we
488 employed the SEWMWBS, Teisman et al. [34] assessed mental wellbeing using the Psychological
489 Wellbeing Scale, which has six separate subscales (e.g. autonomy, environmental mastery, purpose
490 in life). Whilst there is some overlap (i.e., both consider positive relationships with others), it could
491 be argued that they are tapping into different aspects of mental wellbeing. These studies are the first
492 to examine this relationship and so further replication is necessary.

493 4.5. *Strengths and Limitations*

494 The current study has three key strengths. First, the prospective design of the current
495 investigation provides novel insights into the role of mental wellbeing as a protective factor for
496 future thoughts and self-harm. By collecting longitudinal data, we have been able to take a positive
497 step beyond examining mental wellbeing as a correlate of these thoughts and behaviours, which is
498 valuable in understanding the role of mental wellbeing in self-harm. Second, the current
499 investigation employed standardised measures that have been validated for use within adolescent
500 samples [23,45]. Third, the current investigation recruited a sample of adolescents from the
501 community. Research has consistently demonstrated that the vast majority of adolescent self-harm
502 occurs "hidden" in the community, and does not come to the attention of clinical services [3,57]. The
503 hidden nature of the majority of self-harm, alongside the reported differences between young people
504 who do and do not present to health services after harming themselves [58-59], highlights the need
505 for community-based research and prevention efforts.

506 Despite these strengths, findings should be interpreted within the context of the following two
507 limitations. First, and most notably, attrition was high between waves of data collection, and one
508 school withdrew their participation entirely. The follow up response rate of the current investigation
509 was 54.8%, which is lower than that of another longitudinal study of self-harm in Scotland (69.8%)
510 [47]. As such, it is possible that this attrition may have biased our results in terms of prevalence
511 estimates and associations. Though adolescents who took part in the second wave of data collection
512 had broadly similar profiles across the majority of variables compared with those who did not, it
513 was also true that those lost to attrition were more likely to report a history of self-harm at baseline.
514 This has been reported in previous research [60] and is not surprising given that young people who
515 engage in self-harm are more likely to be absent or truant from school [61]. Therefore, we were less
516 likely to capture these individuals at follow up. As our study is likely to have underestimated the
517 number of participants that engaged in repeat self-harm, our findings should be interpreted with
518 caution.

519 Whilst the current investigation is prospective in nature, there were only two waves of data
520 collection. As a result of overlapping time periods in the assessment of some variables, it was not
521 possible to determine temporal precedence with regards the multi-step mediational pathway linking
522 sleep problems and self-harm thoughts [62]. Therefore, it is not possible to rule out alternative causal
523 pathways. Future research applying multi-wave longitudinal cohort designs, would allow for an
524 enhanced understanding of how processes unfold over time during adolescence. Further,
525 micro-longitudinal investigations, such as daily diary studies or work implementing experience
526 sampling methodologies, would allow for a more high-resolution examination of the relationship
527 between these variables in daily life.

528 4.6. Implications

529 This investigation provides preliminary evidence that mental wellbeing is a factor which
530 should be included within the pre-motivational phase of the IMV, conceptualised as a *protective*
531 background factor. Public mental health encompasses the promotion of mental wellbeing, the
532 prevention of mental illness, and recovery from mental health problems. The majority of research to
533 date has focused on the role of mental health problems in relation to self-harm risk during
534 adolescence. Whilst this research does improve our understanding of the challenges that young
535 people experience (and how these may heighten a young person's vulnerability to thinking about or
536 engaging in self-harm), the current study demonstrates the value of considering other dimensions of
537 public mental health and investigating factors that may reduce self-harm risk. Further research of
538 this nature will provide novel insights that could help to refine theoretical conceptualisations of
539 self-harm.

540 The current investigation is the first to examine the link between mental being and adolescent
541 self-harm risk within the context of a theoretical framework. Our findings suggest that greater
542 mental wellbeing is associated with lower risk of self-harm thoughts and behaviours, as well as a
543 reduction in defeat and entrapment (the negative appraisals that have been shown to be proximal
544 predictors of intention to harm themselves). These results highlight that mental wellbeing could be
545 one useful target which if incorporated within prevention and early intervention efforts, could
546 protect young people against self-harm risk.

547 Mental wellbeing is modifiable and schools are a natural setting for the implementation of
548 programmes that seek to maintain or improve mental wellbeing during adolescence. Taking a
549 universal approach (and including all young people in a year group or school) can potentially
550 reduce stigma and is particularly suited to a focus on mental wellbeing [63]. There is preliminary
551 evidence to suggest that programmes of this nature can increase mental wellbeing in young people.
552 These include teaching mindfulness as a way of working with every day stressors and experiences,
553 or accessing websites such as "Bite Back" that consists of information and interactive activities that
554 relate to a variety of different wellbeing domains including gratitude, optimism, healthy lifestyle,
555 and positive relationships [64]. Nature-based prescribing may also have the potential to support and
556 improve mental wellbeing and could be considered alongside school-based programmes [65]. Taken

557 together, findings supporting the amenability of mental wellbeing to intervention are particularly
558 important given its protective role within the context of self-harm risk and wider public health.

559 5. Conclusions

560 Previous research has largely focused on factors that heighten a young person's vulnerability to
561 self-harm risk, and investigations focusing on protective factors are limited. Research of this nature
562 is crucial if we are to better understand and reduce self-harm within the adolescent population.
563 Mental wellbeing is receiving increasing attention worldwide, and our findings show that it may
564 offer protection against self-harm risk by reducing perceptions of defeat and entrapment. Future
565 prevention and intervention efforts should incorporate strategies which promote mental wellbeing.

566 **Supplementary Materials:** The following are available online at www.mdpi.com/xxx/s1.

567 Table S1: Point estimates for indirect effects and 95% bias corrected confidence intervals for serial multiple
568 mediation analysis in which defeat, and internal entrapment were represented as mediators in the association
569 mental wellbeing and self-harm thoughts (controlling for gender, depression, and external entrapment),

570 Table S2: Point estimates for indirect effects and 95% bias corrected confidence intervals for serial multiple
571 mediation analysis in which defeat, and external entrapment were represented as mediators in the association
572 between mental wellbeing and self-harm thoughts (controlling for gender, depression, and internal
573 entrapment),

574 Table S3. Point estimates for indirect effects and 95% bias corrected confidence intervals for serial multiple
575 mediation analysis in which defeat, and internal entrapment were represented as mediators in the association
576 mental wellbeing and self-harm behaviours (controlling for gender, depression, and external entrapment).

577 Table S4. Point estimates for indirect effects and 95% bias corrected confidence intervals for serial multiple
578 mediation analysis in which defeat, and external entrapment were represented as mediators in the association
579 between mental wellbeing and self-harm behaviours (controlling for gender, depression, and internal
580 entrapment),

581 Table S5. Point estimates for effects and 95% confidence intervals for moderation analysis in which mental
582 wellbeing was represented as a moderator in the relationship between internal entrapment at baseline and
583 prospective self-harm thoughts (controlling for gender, depression, and external entrapment),

584 Table S6, Point estimates for effects and 95% confidence intervals for moderation analysis in which mental
585 wellbeing was represented as a moderator in the relationship between external entrapment at baseline and
586 prospective self-harm thoughts (controlling for gender, depression, and internal entrapment)

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589 S.C.H.; project administration, K.R., S.R, & S.C.H.; funding acquisition, K.R., S.R, & S.C.H All authors have read
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