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Preferences in Information Processing and Suicide:

Results from a Young Adult Health Survey in the United Kingdom

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21   **Abstract**

22   Background: Suicide prevention literature currently suffers from inconsistent measurement and

23   incomplete theoretical development.

24   Aims: Using a recommended suicide measurement approach for epidemiological studies (i.e., the Suicidal

25   Behaviors Questionnaire-Revised; SBQ-R), the present investigation assessed United Kingdom young

26   adult suicide prevalence rates. This study also investigated the utility of a Preferences in Information

27   Processing (PIP) model of suicide in identifying those at increased odds for elevated suicide risk, as well

28   as lifetime ideation and attempt.

29   Method: A cross-sectional mental health and well-being survey study (n=414) was conducted.

30   Results: The prevalence rates of elevated risk (49.8%), lifetime ideation only (55.3%), and lifetime

31   attempt (13.5%) were high. Bivariate associations demonstrated that elevated depression, anxiety, and

32   Need for Affect (NFA) Avoidance were associated with worsened suicide outcomes, whereas elevated

33   Need for Cognition (NFC) was associated with decreased suicide risk. Logistic regression results

34   identified depression and NFA Avoidance as the strongest predictors of elevated suicide risk. Multinomial

35   logistic regression results established several PIP-based moderation effects for depression and anxiety in

36   which NFA Approach and NFC differentially influenced odds of suicide attempt group membership.

37   Conclusions: The SBQ-R is an appropriate tool for UK young adult suicide research. NFA and NFC

38   demonstrated potential for inclusion in young adult suicide prevention programming. Further research is

39   needed to fully evaluate the PIP model of suicide and effectiveness of proposed theory-based approaches

40   to suicide prevention.

41   Key Words: Suicide; Need for Affect; Need for Cognition; Depression; Anxiety; Young Adult

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Introduction

Suicide is a major public health problem. Globally, there were an estimated 788,000 suicide

deaths in 2015 (WHO, 2017a). The rate in the United Kingdom (UK) was 7.4/100,000 in 2015 (WHO

2017b). More recent non-age standardized data show a crude suicide rate of 8.9 in 2016 (WHO, 2018).

Recent population-based estimates for young adults aged 18-34 ranged from 5.3 to 12.0 per 100,000

individuals (ONHS, 2016). High risk for young adults mirror numerous studies that have found age to be

inversely related to suicidal ideation and behaviors (Bernal et al., 2007; Borges et al., 2008; Nock et al.,

2008). Identification of theoretically-based factors pertinent to risk and prevention is still lacking. The

present study sought to identify such factors within a public health-informed approach to quantifying

suicide. Batterham and colleagues (2015) conducted a systematic review of established suicide measures

for best use in health survey research. Among the criteria evaluated were utility, comprehensiveness,

psychometrics, and availability. The Suicidal Behaviors Questionnaire-Revised (SBQ-R; Osman et al.,

2001) strongly satisfied all criteria; further, the tool is flexible in its use (e.g., total score, cut-score,

individually usable items) and addresses four aspects of lifetime suicide-related behavior (Batterham et

al., 2013). Moreover, the SBQ-R is appropriate for the present study's sample of interest. For instance, the

total score has demonstrated acceptable internal consistency values in the young adult suicide literature

(Batterham et al., 2013; Cramer et al., 2016, 2017). Osman and colleagues (2001) also demonstrated the

value of a cut-off score for general population samples that differentiates no risk from elevated risk. This

approach has been used as a common outcome to differentiate suicide risk in various college and

community samples (Becker et al., 2018; Cramer et al., 2017). Individual items from the SBQ-R have

also been used in the ideation-to-action literature to identify factors distinguishing controls, ideators and

attempters (Gonzalez, 2012; Rimes et al., in press).

The present study is informed by a recent paradigmatic shift in understanding suicide: ideation-

to-action frameworks (Klonsky et al., 2018). Historically, suicide research has focused on singular

outcomes such as total score on an ideation measure or association with lifetime attempt history. More

recently, however, ideation-to-action approaches have sought to understand factors that may explain how

72   or under what conditions a person's suicidal thinking transitions to an attempt or, ultimately, death by

73   suicide. As such, ideation-to-action frameworks presume that risk/protective factors for suicide ideation

74   and attempt/death may differ, and that there are particular factors that can inform understanding of the

75   ideation-to-action pathway. For example, Klonsky and colleagues' (2018) literature review suggested that

76   the behavioral acquired capability for suicide meaningfully differentiates ideators from attempters.

77   Following this emerging pattern in suicide research, prevention and intervention efforts necessitate

78   identification of factors distinguishing controls (i.e., persons without a history of ideation or attempt),

79   ideators (i.e., persons with a history of suicide ideation but no attempts) and attempters. Such factors can

80   then become targets of prevention and intervention programs. The present study tests the Preferences in

81   Information Processing (PIP; Cramer et al., 2016) approach to suicide risk and ideation-to-action in a

82   young adult sample beyond the United States for the first time. In doing so, we seek to: (1) replicate and

83   extend PIP predictions of suicide risk level, and (2) examine for the first time whether PIP variables can

84   differentiate non-suicidal controls, suicide ideators, and suicide attempters. We briefly review depression-

85   and anxiety-based suicide literature in order to establish grounding for the present study.

86   **Depression and Anxiety as Key Factors in Suicide**

87   Depression has been shown to be among disorders with the highest suicide risk (Brown et al.,

88   2000; Chesney et al., 2014; Large et al., 2011). The depression-suicide ideation/risk association has been

89   substantiated in several systematic reviews and meta-analyses (Harris & Barraclough, 1997; Johnson et

90   al., in press). Anxiety has also been shown to relate to suicide, both alone and in conjunction with

91   depression. Multiple reviews (Bentley et al., 2016; Kanwar et al., 2013) have found strong support for

92   several types of anxiety disorders being associated with greater risk for suicide ideation and attempts. In

93   regards to co-morbidity, risk of suicide has been found to be greater for those with diagnoses of

94   depression when they also have symptoms of anxiety (Hawton et al., 2013). From an ideation-to-action

95   purview, when suicide ideators were compared to suicide attempters, depression was found to be higher

96   for ideators whereas anxiety was higher for attempters (May & Klonsky, 2016).

97   The influences of depression and anxiety on suicidality have been further understood through

98   existing theories. For example, Beck's (1976) cognitive model emphasizes that dysfunctional attitudes

99   lead to cognitive errors (e.g., dichotomous thinking) which contributes to pervasive depressive/anxious

100   views. Depression and anxiety also fit within ideation-to-action perspectives such as the integrated

101   motivational-volitional model of suicidal behavior (IMV; O'Connor, 2011). The model consists of three

102   sequenced phases: (1) the pre-motivational phase describing background factors (e.g., biological

103   predisposition) and triggers (e.g., life events) for suicidal ideation; (2) the motivational phase articulating

104   how negative thinking styles (e.g., humiliation, defeat) give rise to suicidal ideation; and (3) the volitional

105   phase highlighting moderating factors (e.g., acquired capability for suicide) that facilitate or inhibit

106   ideation from being translated into behaviors. In the model's pre-motivational phase, depression and/or

107   anxiety could be viewed as diathesis/pre-dispositional factors that might affect subsequent movement

108   through stages. Moreover, depressive or anxious thinking may also capture motivational phase factors

109   such as rumination. However, gaps remain concerning evaluation of factors that may amplify or buffer

110   the effects of depression and anxiety on suicide. The present investigation fills this gap through the PIP

111   lens.

112   **Preferences in Information Processing: Theory and Application**

113   Dual process models of information processing underlie the PIP perspective. Such models

114   (Cacioppo & Petty, 1982; Kirkpatrick & Epstein, 1992) posit that decision-making is a function of two

115   parallel modes of thinking: a heuristic/emotional (i.e. system 1) and a rational/effortful (i.e., system 2)

116   pathway of decision-making. These models have demonstrated empirical utility in a range of topics such

117   as marketing (Petty & Briñol, 2016) and legal (Gunnell & Ceci, 2010) decision-making. Recent literature

118   has also measured proxies for these two streams of information processing: Need for Affect (NFA; Appel

119   et al., 2012; Maio & Esses, 2001) and Need for Cognition (NFC; Cacioppo & Petty, 1992, 1996). NFA

120   concerns the extent of one's preference for engaging with emotional experiences and information,

121   inclusive of both positive and negative affect (Maio & Essess, 2001). NFC is defined as the extent of

122   one's preference for effortful thinking, complexity, and mentalization (Cacioppo & Petty, 1996). NFA

123   and NFC, therefore, constitute attitudes or preferences concerning emotional (i.e., system 1) and cognitive

124   (i.e., system 2) information processing (Cramer et al., 2016). NFC and NFA have, independently and

125   jointly, been widely applied to a range of outcomes such as perceptions of hate crimes (Cramer et al.,

126   2013) and political beliefs (Arceneaux & Vander Wielen, 2013).

127   The PIP approach to understanding suicide risk (Cramer et al., 2016, 2017) draws on dual

128   process, NFA, and NFC theories to provide testable hypotheses. Consistent with a prominent dual process

129   perspective, namely the Elaboration Likelihood Model (ELM; Petty & Briñol, 2015), the extent of

130   effortful thinking is hypothesized to moderate the influence of affect (e.g., depression) or approach to

131   emotion (i.e., NFA) on subsequent outcomes (e.g., thinking patterns, decisions). For instance, where

132   preference for, or engaging in, mental effort is low, emotions directly impact attitudes and decisions via

133   heuristic streams in ways consistent with the positive or negative nature of the emotion. NFA theory and

134   research (Appel et al., 2012; Maio & Esses, 2001) hold that: (1) NFA is comprised of two distinct sub-

135   factors (Avoidance and Approach) that (2) can impact emotional states and decisions directly or via

136   interaction with other constructs. Finally, NFC literature (Cacioppo & Petty, 1996; Petty & Briñol, 2015;

137   Petty et al., 2007) suggests that high levels of mental effort are associated with susceptibility to

138   affectively-charged experiences and the tendency to excessively cogitate about one's own thinking.

139   Only recently have dual process or NFA/NFC studies been evaluated with mental health relevant

140   topics such as alcohol use (Lindgren et al., in press) and violence risk assessment (Cramer, Wevodau et

141   al., 2017). Two studies (Cramer et al., 2016, 2017) have tested one or both key PIP constructs with

142   respect to suicide in student and community samples. Key findings suggest that: (1) NFA Avoidance is

143   consistently associated with elevated suicide risk (as defined by the SBQ-R); (2) NFA Approach received

144   partial support as a risk factor for suicide; (3) NFC moderates the influence of NFA Approach such that

145   the positive approach-suicide association is most pronounced for those high in NFC, and (4) NFA

146   Avoidance may moderate the effect of depression on suicide risk in a manner consistent with depression

147   amplification models (Capron et al., 2014; Pennington et al., 2015) that suggest the influence of

148   depression on suicide may worsen for those preferring to avoid emotion (Cramer et al., 2016). A PIP view

149 of suicide presumes that it is necessary to examine both NFA and NFC in a model to fully understand

150 how PIP impact suicide. Gaps remain in the development of this theoretical perspective. For example,

151 NFA and NFC have only been evaluated with suicide in American young adults. Moreover, depression is

152 the only mental health topic addressed within this framework to date (Cramer et al., 2016). The present

153 study rectified these limitations through inclusion of anxiety, and testing the model in a UK young adult

154 sample.

155 **The Present Study**

156   The present study conducts the first PIP test of suicide beyond the United States. In doing so, we

157 control for two demographic correlates of suicide: age (Borges et al., 2010; Nock et al., 2008) and gender

158 (Antony et al., 1998; Liotta et al., 2015). We proffered the following hypotheses: (H1) NFA Avoidance

159 will display a significant positive association with suicide risk. (H2) NFA Approach will display a

160 significant positive association with suicide risk. (H3) In support of PIP and depression-amplification

161 models of suicide risk, the influence of depression on suicide risk will be strongest for those high in NFA

162 Avoidance. (H4) In support of a PIP approach to suicide risk, the influence of NFA Approach on suicide

163 risk (i.e., H2) will be strongest for those high in NFC. We also extend PIP approaches in two exploratory

164 research questions (RQs): (RQ1) Do PIP characteristics moderate the influence of anxiety on suicide-

165 related outcomes? (RQ2) Do PIP characteristics differentiate controls from suicide ideators and suicide

166 ideators from suicide attempters (i.e., ideation-to-action framework)?

167   **Method**

168 **Participants**. A total of 414 participants completed survey measures of interest.[1] The young adult

169 (M_{age}=23.26, SD=3.75) group reported gender as female (n=323, 78.0%), male (n=81, 19.6%), and

170 transgender (n=10, 2.4%). Race was relatively homogenous: White (n=387, 93.5%), Asian (n=8, 1.9%),

171 'other' (e.g., Black; n=18, 4.3%), and one person failed to list race.

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[1] Four participants from the full 418 person pool were dropped because their reported ages fell beyond the young adult-defined range or they failed to report gender.

172   **Procedure**. Approved by two University Ethics Committees, the present investigation featured a cross-

173   sectional self-report public health surveillance design. A mental health and well-being Qualtrics survey

174   advertised specifically to young adults (ages 18-34) in the United Kingdom was distributed via a range of

175   recruitment streams. The National Health Service (NHS) offices, social media (e.g., Twitter, Facebook),

176   paper (e.g., flyers in community agencies), and in-person campus and community in-person approaches

177   were utilized. Each advertisement stream included a summary study description and survey link. No

178   inclusion or exclusion criteria were advertised with the exception of young adult age. Interested

179   participants visited the survey link at which time they were provided a standard participant information

180   sheet and e-consent form (e.g., including rights of a research participant, investigator and mental health

181   resource contact information). Checking a consent box prior to the survey battery indicated consent,

182   although participants were informed of the ability to withdraw at any time. Participants received a

183   debriefing form upon survey completion.

184   **Measures**

185   **Demographics**. Participants completed a standard demographic form requesting information such

186   as age, gender and race.

187   **Suicide risk**. Suicide-related outcomes were assessed with the SBQ-R (Osman et al., 2001). The

188   SBQ-R is a four-item screener of the following aspects of suicide-related behavior: lifetime behavior

189   (none, ideation, attempt), frequency of suicidal ideation in the last year, lifetime indication of suicidal

190   communications, and estimation of a future suicide attempt likelihood. The present study utilized both the

191   cut-score (to test clinical risk determination) and SBQ-R item to separate controls, ideators, and

192   attempters (to test the ideation-to-action perspective) (see literature review for details).

193   **Mental health**. The Depression Anxiety Stress Scale (DASS-21; Antony et al., 1998) examines

194   the degree of depression, anxiety, and stress symptoms an individual has felt during the past week. Each

195   statement is measured on a scale of 0-3. The DASS-21 provides subscale scores for depression, anxiety,

196   and stress. Internal consistency for all subscales has been high (Antony et al., 1998; Cramer et al., 2016).

197   Internal consistency values in the present study were: depression (.93), anxiety (.88), and stress (.88).

198   **NFA**. NFA Approach and Avoidance were assessed using the Need for Affect Questionnaire-

199   Short Form (NAQ-S; Appel et al., 2012). The NAQ-S contains 10 items, with five questions per

200   subscale. Questionnaire items are measured on a 7-point scale ranging from -3 to 3. Internal consistency

201   values for both subscales have consistently been acceptable across studies (Appel et al., 2012; Cramer et

202   al., 2016, 2017). Cronbach's alpha in this sample were: Approach (.71) and Avoidance (.83).

203   **NFC**. The Need for Cognition Scale (Cacioppo & Petty, 1982; Lord & Putrevu, 2006) is an 18-

204   item measure providing a summed total score where higher scores reflect greater NFC. Items are

205   measured on a 5-point scale. Internal consistency values have been high in prior studies (Cramer et al.,

206   2016; Lord & Putrevu, 2006). Cronbach's alpha for the present study was good (.88).

207   **Statistical Analyses**. Prevalence rates for elevated suicide risk level and lifetime ideation and attempt

208   subgroups were tabulated. Between-groups tests for categorical suicide-related groupings were used to

209   assess differences in continuous PIP and mental health outcomes. Effect sizes were Cohen's *d* values,

210   with interpretation of magnitude of effects guided by the statistical literature (Cohen, 1988). Following

211   statistical literature guidelines (Cohen et al., 2003; Hosmer & Lemeshow, 2005), logistic regression (for

212   clinical risk analyses) and multinomial logistic regression (for ideation-to-action framework analyses)

213   were used to identify factors differentiating suicide-related groups. Odds ratio magnitude was determined

214   by guidelines in the statistical literature (Chen et al., 2010).

215   **Results**

216   **Suicide prevalence rates and bivariate associations with PIP and mental health.** Approximately

217   equivalent suicide risk subgroups were observed: no risk (n=208, 50.2%) versus elevated risk (n=206;

218   49.8%). The spread of lifetime suicide ideation-to-action framework subgroups was as follows: None

219   (n=129, 31.2%), ideators (n=229, 55.3%), and attempters (n=56, 13.5%).

220   Table 1 contains statistics for between-groups analyses of PIP and mental health variables by

221   suicide risk group and ideation-to-action group. Compared to no risk counterparts, the elevated suicide

222   risk group possessed significantly higher levels of depression (Cohen's *d*=1.41; large effect), anxiety

223   (Cohen's *d*=1.09; large effect), and NFA Avoidance (Cohen's *d*=0.93; large effect), as well as

224   significantly lower levels of NFC (Cohen's d=-0.29; small effect). Ideation-to-action subgroups displayed

225   significant overall effects on depression, anxiety and NFA Avoidance. Inspection of Table 1 shows the

226   following depression patterns: attempters possessed significantly greater levels compared to both the none

227   group (Cohen's d=1.78; large effect) and ideators (Cohen's d=0.40; moderate effect). Further, ideators

228   reported significantly higher levels compared to the none group (Cohen's d=1.25; large effect). Anxiety

229   differentiated subgroups such that both attempters (Cohen's d=1.15; large effect) and ideators (Cohen's

230   d=0.86; large effect) displayed significantly higher levels than member of the none group. NFA

231   Avoidance differentiated subgroups such that both attempters (Cohen's d=1.04; large effect) and ideators

232   (Cohen's d=0.75; large effect) displayed significantly higher levels than members of the none group.

233   **Logistic regression predicting suicide risk group**. Hypotheses 1 through 4, and RQ1, were addressed

234   via the logistic regression model. Simultaneous entry of the following set of predictors classified suicide

235   risk level (0=no risk, 1=elevated risk): (a) control variable main effects for gender (transgender coded

236   reference group) and age; (b) mental health and PIP main effects for depression, anxiety, NFA

237   Avoidance, NFA Approach, and NFC, and; (c) PIP-supported interaction terms of depression-NFA

238   Avoidance, depression-NFA Approach, depression-NFC, anxiety-NFA Avoidance, anxiety-NFA

239   Approach, anxiety-NFC, NFA Avoidance-NFC, and NFA Approach-NFC.

240   Table 2 contains summary statistics for the full model. The set of predictors demonstrated

241   significant and large sized effects for classification of suicide risk level, $\chi^2(16)$=189.97, p<.001, Cox &

242   Snell R^2=.37, Nagelkerke R^2=.49. The model demonstrated acceptable fit, Hosmer & Lemeshow

243    $\chi^2(8)$=4.25, p=.83. In support of H1, NFA Avoidance demonstrated a small significant increased odds of

244   elevated suicide risk. Moreover, both depression (small-to-moderate) and anxiety (small) demonstrated

245   significant increased odds of elevated risk. Hypotheses 2 (NFA Approach main effect), 3 (depression-

246   NFA Avoidance interaction), and 4 (NFA Approach-NFC interaction) were all unsupported. Likewise,

247   RQ1 showed no anxiety-PIP interactions.

248   **Multinomial logistic regression predicting ideation-to-action group**. RQ2 concerning application of

249   the PIP to an ideation-to-action suicide paradigm was addressed via a multinomial regression model. The

250   identical set of predictors were included via simultaneous entry. Suicide was coded as 0=control,

251   1=ideation only, and 2=attempters. Ideation was selected as the reference group because the central

252   question within an ideation-to-action framework (Klonsky et al., 2018) concerns what characteristics

253   differentiate controls from ideators and ideators from attempters.

254   The set of predictors demonstrates significant differentiation (large effect) of suicide ideation-to-

255   action groups, $\chi^2(32)=188.81$, $p<.001$, Cox & Snell $R^2=.37$, Nagelkerke $R^2=.43$. The model demonstrated

256   good fit to the data, $\chi^2(32)=737.72$, $p=.92$. The following predictors demonstrated significant overall

257   effects on the set of ideation-to-action groups: (1) Age: $\chi^2(2)=11.41$, $p=.003$; (2) depression: $\chi^2(2)=46.81$,

258    $p<.001$; (3) NFA Avoidance: $\chi^2(2)=12.52$, $p=.002$; (4) depression-NFA Approach interaction: $\chi^2(2)=6.06$,

259    $p=.048$; (5) anxiety-NFC interaction: $\chi^2(2)=7.36$, $p=.02$; and (6) NFA Avoidance-NFC interaction:

260    $\chi^2(2)=8.97$, $p=.01$. Table 3 contains full univariate model results. Depression (large effect) and NFA

261   Avoidance (small effect) demonstrated significantly increased odds of suicide ideation group membership

262   (this interpretation requires taking the inverse of odds ratios below 1.00 in Table 3).

263   In the ideator-attempter model, increases in age (small effect) demonstrated significantly

264   increased odds of suicide attempt group membership. Three two-way PIP-related interactions also

265   demonstrated significant, yet small, associations with ideation-attempt group status: Depression-NFA

266   Approach, anxiety-NFC, and NFA Avoidance-NFC. Inspection of the interactions suggests the following

267   patterns. First, an association of depression with increased likelihood of suicide attempt group

268   membership lessens as NFA Approach increases. In other words, NFA Approach is a protective factor for

269   a depression-suicide attempt link. Second, an association of anxiety with increased likelihood of suicide

270   attempt group membership lessens as NFC increases. In other words, NFC is a protective factor for an

271   anxiety-suicide attempt link. Finally, an association of NFA Avoidance with increased likelihood of

272   suicide attempt group membership worsens as NFC increases. In this instance, NFC is a risk factor for an

273   NFA Avoidance-suicide attempt link.

274   **Discussion**

275   NFA Avoidance demonstrated robust association with elevated suicide risk. NFC bivariate

276   differences by suicide risk level washed out in the full regression model. These findings suggest,

277   consistent with prior studies (Cramer et al., 2016, 2017), the primacy of NFA Avoidance when evaluating

278   suicide risk level. There were also no observed interaction patterns affecting clinical risk grouping, yet

279   two interactions were observed in one prior study using the SBQ-R total score. In a clinical risk

280   determination framework (Bryan & Rudd, 2006), PIP (Cramer et al., 2016) and depression-amplification

281   (Capron et al., 2014) based moderation effects have therefore yielded no value. When clinicians are

282   evaluating and treating along a suicide risk determination approach, NFA Avoidance may be a target of

283   assessment, formulation and intervention. For instance, NFA Avoidance may represent its own necessary

284   category of risk assessment inquiry beyond those articulated in prior literature (Bryan & Rudd, 2006).

285   Moreover, emotionally-avoidant attitudes may become a treatment goal within Collaborative Assessment

286   and Management of Suicide (CAMS; Jobes, 2012). CAMS is a leading evidence-based suicide-specific

287   therapy and risk management approach inclusive of mutually defined clinical goals between the patient

288   and therapist (Jobes, 2012). Where appropriate, emotionally-avoidant attitude reduction may become a

289   target of therapy in order to improve factors contributing to the patient's suicidality. Normative data and

290   psychometrics properties for the NAQ-S exist in non-clinical samples (Appel et al., 2012; Cramer,

291   Wevodau et al., 2017). A logical next step would be to establish norms and psychometrics in clinical or

292   high-risk populations in order to test the scale's utility in formal risk assessment and treatment

293   monitoring.

294   Present PIP-related findings demonstrated meaningful theory-based value as applied to the

295   ideation-to-action perspective of suicide (Klonsky et al., 2018). Contrary to regression results of the

296   clinical risk model, ideation-to-action framework results suggest that PIP/depression-amplification

297   propositions (Capron et al., 2014; Cramer et al., 2016) concerning the moderating influences of both NFA

298   and NFC are critical, specifically when applied to differentiating suicide ideators and attempters. Contrary

299   to any prior literature or expectations, NFA Approach served as a protective factor in the depression-

300   suicide attempt link. This finding is somewhat surprising given that NFA Approach has: (a) been

301   theorized to precede expression and management of negative emotionality (Maio & Esses, 2001); (b)

302   driven changes in hostility (Wevodau et al., 2014); and (c) demonstrated prior significant positive

303   association with trait neuroticism (Appel et al., 2012; Cramer, Wevodau et al., 2017). One might expect

304   NFA Approach to worsen the influence of depressive symptoms on transitioning suicide ideation to

305   attempts, especially in light of prior research suggesting depression plays a particularly important role in

306   the formation of suicidal ideation (May & Klonsky, 2016). NFA Approach serving a protective role may

307   suggest that a willingness to face affective depressive symptoms (e.g., sadness) reduces risk of the

308   ideation-to-behavior transition. NFA Approach may serve as a context-dependent protective factor

309   (against depression) in an ideation-to-action framework.

310   NFC operated as a protective factor in the anxiety-suicide attempt link. Prior literature has

311   implicated anxiety in the transition from ideation to attempt (Benley et al., 2016; May & Klonsky, 2016).

312   NFC attenuating this potential pathway makes sense when contextualized by dual process models. For

313   example, a basic assumption of ELM (Petty & Briñol, 2015) is that NFC can mitigate the influence of

314   emotion on decisions or behaviors. Such may be occurring in this instance; anxiety, or fear/worry

315   (negative emotions) out of proportion with actual threat, may be overridden or buffered by NFC. In other

316   words, the desire for cognitive complexity and understanding associated with higher NFC (Lord &

317   Puterevu, 2006) may buffer both the anxious affect and/or suicide ideation itself. Such a protective pattern

318   warrants further inspection.

319   NFC operates as a context-dependent risk or protective factor, an increasingly strong PIP

320   theoretical premise. Whereas NFC was a protective factor against anxiety in the ideation-to-action

321   framework, it served as a risk factor in the NFA Avoidance-suicide attempt association. Cramer and

322   colleagues (2016) offer PIP-informed insight into what may be occurring here when they speculated that

323   NFA Avoidance might be conceptualized "as an internalizing process and these parallel internalizing

324   processes in combination elevate suicide risk" (p. 388). In this instance, internalizing or suppressing

325   emotional experience, in combination with extreme mental effort to the point of mental exhaustion, may

326   contribute to suicide ideation transitioning to attempt. Overall, NFC may mitigate or exacerbate risk for

327   suicide attempt depending on a range of other individual differences.

328   The broader body of suicide ideation-to-action literature (Dhingra et al., 2015; Klonsky et al.,

329   2018; O'Connor et al., 2012; Van Orden et al., 2008) has identified numerous factors associated with the

330   ideation-to-attempt pathway among young adult and other populations. These include impulsivity,

331   acquired capability for suicide (e.g., exposure to pain), and exposure to suicide. NFA Approach and NFC,

332   two core aspects of a PIP suicide model (Cramer et al., 2016), moderate the influence of mental health on

333   attempt status. It is noteworthy that NFA Approach and NFC are inconsistent with other moderators of

334   the ideation-to-attempt pathway in that they concern attitudes, as opposed to social learning or behavioral

335   characteristics. This broad set of factors associated with suicide attempt is of most potential value for

336   suicide prevention and intervention efforts when targeting those already experiencing suicide ideation.

337   For instance, public health approaches to prevention such as free community depression and suicide

338   screenings may also examine factors like NFA and NFC. Moreover, mental health education and training

339   for lay and healthcare professional audiences may include content on factors influencing the ideation-to-

340   attempt pathway. We tender these recommendations with the additional suggestion that future research is

341   needed to test long-term PIP-related influences on suicide.

342   Although not the central focus of the study, it is noteworthy that rates of elevated suicide risk,

343   lifetime ideation only and attempts among UK young adults were troublingly high. Granted, these

344   numbers should be interpreted with some caution due to the low sample size in the present study;

345   however, they represent a beginning point to understand the current scope of the suicide problem among

346   UK young adults using a psychometrically-supported measure of suicidality for large-scale survey

347   research (Batterham et al., 2015). Despite problems with defining suicidality noted in the literature

348   (Hasley et al., 2008; Silverman & De Leo, 2016), the SBQ-R (Osman et al., 2001) offers a brief, flexible

349   tool we strongly encourage use of in future UK young adult suicide surveillance work.

350   The present study contained several limitations. Sample size and restricted demographic diversity

351   limit extrapolation of findings to broader populations, an especially important constraint pertinent to

352   epidemiological conclusions concerning UK young adult suicide. Although this study was one of the first

353   and most thorough examinations of PIP constructs with suicide, the cross-sectional and self-report design

354   aspects also temper theoretical conclusions. Finally, as is common in suicide and other mental health

355   literatures, we examine only one theoretical framework in the present study. Moving forward, PIP

356   literature should be tested against or integrated with other prominent theories of suicide in prospective

357   designs.

358

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Table 1. Preferences in Information Processing and Mental Health Comparisons by Suicide Risk and Ideation-to-Action Subgroups.

| Outcome | T^1 | Suicide Risk Level Group | | F^2 | Suicide Ideation-to-Action Group | | |
		No risk	Elevated risk		None	Ideation Only	Attempt
Depression	14.34***	4.34 (4.60)	11.90 (6.03)	72.26***	3.30 (3.71)$_{a,b}$	9.78 (6.31)$_{a,c}$	12.32 (6.43)$_{b,c}$
Anxiety	10.87***	4.45 (4.57)	10.03 (5.65)	36.44***	4.04 (4.29)$_{a,b}$	8.37 (5.68)$_a$	10.21 (6.28)$_b$
Approach	-1.19	6.21 (4.84)	5.63 (4.96)	1.29	5.78 (4.97)	6.21 (4.70)	5.07 (5.52)
Avoidance	9.44***	-4.47 (6.40)	1.89 (7.19)	30.02***	-5.11 (6.33)$_{a,b}$	0.03 (7.24)$_a$	2.18 (7.58)$_b$
Need for Cognition	-3.01**	62.03 (11.67)	58.48 (12.34)	2.44	62.11 (12.27)	59.68 (11.73)	58.39 (13.01)

Notes: All values denote subscale or total score mean (standard deviation); Depression and Anxiety = DASS-21 subscales; Approach and Avoidance = NAQ-S subscales; Need for Cognition = NFC Scale total score; [1] df = 412; [2] df = 2, 411; *** $p \leq .001$; ** $p \leq .01$; For ANOVA results, subgroups in same row with matching subscripts denotes significant difference per Bonferroni post-hoc test (all ps < .01).

Table 2. Logistic Regression Model: Preferences in Information Processing Predicting of Suicide Risk Level Group.

Predictor	B (seB)	Wald χ^2(df)	p	Odd Ratio	Odds Ratio 95% CI
Male gender	1.15 (0.83)	1.90 (1)	.17	3.16	0.61-16.27
Female gender	0.68 (0.79)	0.74 (1)	.39	1.97	0.42-9.25
Age	-0.11 (0.15)	0.54 (1)	.46	0.90	0.67-1.20
Depression	**1.12 (0.19)**	**34.79 (1)**	**< .001**	**3.07**	**2.11-4.46**
Anxiety	**0.48 (0.19)**	**6.66 (1)**	**.01**	**1.62**	**1.12-2.33**
NFA Approach	0.12 (0.15)	0.63 (1)	.43	1.13	0.84-1.52
NFA Avoidance	**0.66 (0.16)**	**15.81 (1)**	**< .001**	**1.93**	**1.39-2.67**
Need for Cognition	0.22 (0.15)	2.13 (1)	.14	1.24	0.93-1.66
Depression x NFA Approach	-0.12 (0.19)	0.42 (1)	.52	0.88	0.61-1.29
Depression x NFA Avoidance	-0.10 (0.21)	0.22 (1)	.64	0.91	0.60-1.36
Depression x Need for Cognition	0.03 (0.19)	0.03 (1)	.86	1.03	0.71-1.50
Anxiety X NFA Approach	-0.13 (0.19)	0.45 (1)	.50	0.88	0.60-1.28
Anxiety X NFA Avoidance	0.17 (0.20)	0.75 (1)	.39	1.19	0.80-1.77
Anxiety X Need for Cognition	-0.02 (0.18)	0.01 (1)	.90	0.98	0.68-1.41
NFA Avoidance X Need for Cognition	0.21 (0.17)	1.52 (1)	.22	1.23	0.88-1.72
NFA Approach X Need for Cognition	0.14 (0.16)	0.73 (1)	.39	1.15	0.84-1.57
Constant	-0.62 (0.77)	0.65 (1)	.42	0.54	-

Notes: B = Regression coefficient; se = Standard error; df = Degrees of freedom; CI = Confidence interval; NFA = Need for Affect; x = Interaction term multiplicative; Transgender coded as reference group for gender main effects; **Bold font** denotes significant predictor.

Table 3. Multinomial Regression Model: Preferences in Information Processing Predicting Suicide Ideation-to-Action Group.

Predictor	B (seB)	Wald χ²(df)	*p*	Odd Ratio	Odds Ratio 95% CI
Control Group Model (Ideator reference group)					
Male gender	-0.38 (1.07)	0.13 (1)	.72	0.68	0.08-5.54
Female gender	-0.11 (1.03)	0.01 (1)	.91	0.89	0.12-6.74
Age	0.23 (0.15)	2.36 (1)	.12	1.26	0.94-1.68
Depression	**-1.49 (0.28)**	**28.71 (1)**	**< .001**	**0.22**	**0.13-0.39**
Anxiety	-0.24 (0.19)	1.13 (1)	.29	0.78	0.50-1.23
NFA Approach	-0.27 (0.19)	2.03 (1)	.15	0.77	0.53-1.10
NFA Avoidance	**-0.62 (0.22)**	**8.00 (1)**	**.005**	**0.54**	**0.35-0.83**
Need for Cognition	-0.33 (0.20)	2.80 (1)	.09	0.72	0.49-1.06
Depression x NFA Approach	-0.36 (0.23)	2.44 (1)	.12	0.69	0.44-1.10
Depression x NFA Avoidance	-0.38 (0.29)	1.71 (1)	.19	0.69	0.39-1.21
Depression x Need for Cognition	0.18 (0.25)	0.54 (1)	.46	1.20	0.73-1.96
Anxiety X NFA Approach	0.48 (0.22)	4.61 (1)	.03	1.62	1.04-2.51
Anxiety X NFA Avoidance	0.03 (0.25)	0.01 (1)	.92	1.03	0.63-1.68
Anxiety X Need for Cognition	-0.34 (0.22)	2.30 (1)	.13	0.71	0.46-1.10
NFA Avoidance X Need for Cognition	-0.17 (0.19)	0.81 (1)	.37	0.84	0.57-1.23
NFA Approach X Need for Cognition	0.11 (0.16)	0.46 (1)	.50	1.12	0.82-1.54
Intercept	-1.12 (1.02)	0.65 (1)	.27	-	-
Suicide Attempter Model (Ideator reference group)					
Male gender	-1.10 (0.86)	1.63 (1)	.20	0.33	0.06-1.80
Female gender	-0.84 (0.78)	1.17 (1)	.28	0.43	0.09-1.98
Age	**0.61 (0.19)**	**10.73 (1)**	**.001**	**1.84**	**1.23-2.66**
Depression	0.39 (0.24)	2.56 (1)	.11	1.48	0.92-2.39
Anxiety	-0.10 (0.25)	0.17 (1)	.68	0.90	0.56-1.46
NFA Approach	0.08 (0.22)	0.12 (1)	.72	1.08	0.71-1.65
NFA Avoidance	0.33 (0.23)	2.15 (1)	.14	1.39	0.89-2.17
Need for Cognition	0.06 (0.20)	0.09 (1)	.77	1.06	0.71-1.58
Depression x NFA Approach	**-0.49 (0.23)**	**4.60 (1)**	**.03**	**0.61**	**0.39-0.96**
Depression x NFA Avoidance	-0.33 (0.23)	2.05 (1)	.15	0.72	0.46-1.13
Depression x Need for Cognition	0.23 (0.23)	1.00 (1)	.32	1.26	0.80-2.00
Anxiety X NFA Approach	0.22 (0.20)	1.20 (1)	.27	1.25	0.84-1.86
Anxiety X NFA Avoidance	0.46 (0.22)	4.59 (1)	.03	1.59	1.04-2.43
Anxiety X Need for Cognition	**-0.58 (0.24)**	**5.89 (1)**	**.01**	**0.56**	**0.35-0.89**

	B (se)	Wald (df)	p	OR	95% CI
NFA Avoidance X Need for Cognition	**0.47 (0.18)**	**6.59 (1)**	**.01**	**1.61**	**1.12-2.31**
NFA Approach X Need for Cognition	0.07 (0.20)	0.12 (1)	.73	1.07	0.72-1.59
Intercept	-0.98 (0.77)	1.63 (1)	.20	-	-

Notes: B = Regression coefficient; se = Standard error; df = Degrees of freedom; CI = Confidence interval; NFA = Need for Affect; x = Interaction term multiplicative; Transgender coded as reference group for gender main effects; **Bold font** denotes significant predictor for which overall test was also significant.