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Behavioral empathy failures and suicidal behavior

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Abstract

Impaired decision-making has recently gained recognition as a component of the suicidal diathesis. Yet, although precipitants and particularly deterrents to suicidal behavior are often interpersonal, little is known about social decision-making in suicidal individuals. This study employed a novel version of the Ultimatum Game to investigate how empathy moderates responses to social conflict in 149 older adults, comprising groups of suicide attempters (n = 49), suicide ideators (n = 32), non-suicidal depressed controls (n = 33), and a non-psychiatric control group (n = 35). Participants acted as responder to a series of single-shot financial offers that varied in fairness. Some offers were paired with social context information on the proposer, designed to evoke either empathy or punishment. Offer acceptance was sensitive to Fairness and Social Context, such that participants accepted more offers in the empathy condition and fewer offers in the punishment condition. A Group * Context interaction was observed, wherein the suicide attempters adjusted their acceptance rates less in the empathy condition than the non-psychiatric controls. Thus, older adults with a history of suicide attempt were less influenced by empathy scenarios, indicating that a failure to integrate others' emotions into decisions may undermine social deterrents to suicide.

Keywords

mood disorder; depression; suicide; suicidal ideation; empathy; Ultimatum Game

Introduction

In a crisis, people often fail to consider how devastating their suicide would be for those around them. Theorists have long observed that relationships that ought to serve as deterrents are lost (Durkheim, 1897), or experienced as a source of suffering (Van Orden et al., 2010) and even direct provocation (Kernberg, 1993). Here, we consider a complementary

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possibility that impaired empathy may undermine the consideration of the social impact of one's suicide, a hypothesis that has not received much empirical consideration to date.

Alterations of broader social functioning in attempted suicide include difficulties in resolving social problems, diminished feelings of connectedness, and relationships that are scarce and conflicted (Duberstein et al., 2004; Gibbs et al., 2009). The neurocognitive mechanisms underlying these difficulties remain poorly understood. We previously reported that older adults with prior suicide attempts were impaired in social emotion recognition (Szanto et al., 2012). Neuropsychological studies indicate that emotion recognition and empathy, as well as performance on other social cognition tasks, all depend critically on the orbitofrontal cortex (Delgado et al., 2016), a region implicated in suicidal behavior by both post-mortem and *in vivo* neuroimaging studies (Arango, Underwood, & Mann, 1997; Dombrovski, Szanto, Clark, Reynolds, & Siegel, 2013; Jollant et al., 2008; Mann, 2003; Oquendo et al., 2003). Patients with behavioral variant frontotemporal dementia (bvFTD), characterized by orbitofrontal degeneration, are impaired on social cognition tasks when compared to patients with Alzheimer's disease (Piguet, Hornberger, Mioshi, & Hodges, 2011). Patients with ventromedial PFC lesions have difficulty with Theory of Mind tasks and perspective taking, with dissociable effects of ventrolateral PFC damage on affective empathy (Shamay-Tsoory, Aharon-Peretz, & Perry, 2009). In bvFTD, these impairments cause significant, real-world difficulties adhering to social norms.

Individual differences in the impact of empathy on real-life social behavior can be inferred from its effects on social decisions in the laboratory. There is accumulating evidence of decision-making alterations in attempted suicide (Dombrovski et al., 2011; Dombrovski & Hallquist, 2017; Szanto, Galfalvy, Vanyukov, Keilp, & Dombrovski, 2018), but less is known about decision-making in social contexts. A recent study modified the Ultimatum Game (UG) to capture how social decision-making (unfair offer rejection) is modulated by social contextual information (O'Callaghan et al., 2016), comparing individuals with and without bvFTD. In a UG task involving a series of single-shot decisions with different partners, some offers were paired with descriptions to evoke empathy (e.g. John is homeless) or hostility (e.g. John is a wealthy investment banker). Individuals with and without bvFTD did not differ in their overall responseto unfair offers. However, while rejection decisions were influenced by the social information in the healthy controls, the bvFTD cases were insensitive to social context. This blunting was correlated with structural deterioration in prefrontal cortex, including ventromedial PFC (O'Callaghan et al., 2016).

Motivated by these observations in bvFTD, as well as the high suicide rate in older adults (Conwell et al., 1996), we conducted an empirical study in older depressed suicide attempters maximally representative of those who die by suicide. We examined how social decisions of suicide attempters were modulated by social contextual information using the modified UG. We included a comparison group of suicide ideators to ascertain whether changes in empathic response were associated with thoughts about suicide or suicidal behavior specifically. We further included a group of depressed older adults without suicidal ideation or attempt to control for the effects of depression,, as well as a non-psychiatric comparison group.

We hypothesized that suicide attempters would be relatively insensitive to the empathy condition on the UG, in line with the prior study in bvFTD. We note that O'Callaghan et al observed modest effects of their punishment context, even in the control group. Thus, while O'Callaghan et al interpret their findings as indicating an overall blunted sensitivity to social context in bvFTD, it is unclear to what extent a neuropsychological hypothesis of suicidal behaviour based on orbitofrontal dysfunction would predict a deficit in the punishment condition. In the present study, we enhanced the punishment scenarios by adding scenarios highlighting either high resources or immoral behavior of the proposers (Delgado, Frank, & Phelps, 2005). We explored the cognitive and personality predictors of social decision making, using the Interpersonal Reactivity Index (IRI) (Davis, 1983) to derive measures of cognitive and affective empathy, and the Barratt Impulsivity Scale to capture impulsivity as a relevant dimension in suicidal behavior (Dumais et al., 2005).

Methods

Participants

Our study included older adults with unipolar depression, the most common antecedent of late-life suicide (Conwell et al., 1996). The participants were 149 older adults, 50.30% women, aged from 50 to 79, mean age 62.34 ± 7.92. Of the full sample, 114 individuals were recruited at a psychogeriatric inpatient unit and outpatient clinics, and further separated into groups of suicide attempters with depression (n = 49), suicide ideators with depression (n = 32), and non-suicidal depressed controls (n = 33). A healthy non-psychiatric control group (n = 35) was also recruited, through community advertisements. Participants provided written informed consent as required by the University of Pittsburgh Institutional Review Board.

Suicide attempters had either a self-injurious act with intent to die within 2 weeks of the study assessment, or history of a past suicide attempt with strong current suicidal ideation at the time of study enrollment. Suicide attempt history was verified by a psychiatrist (KSz or AYD), using all available information: participant's report, medical records, information from the treatment team, and collateral information from family or friends; 16/49 suicide attempters (33%) were recruited within 3 weeks of the attempt, and an additional twenty-one (43%) within 2 years of theattempt. Medical seriousness of attempts was assessed using the Beck Lethality Scale (BLS) (Beck, Beck, & Kovacs, 1975); for participants with multiple attempts, data for the highest-lethality attempt are presented. Suicidal intent associated with the attempt was assessed using Beck's Suicide Intent Scale (SIS) (Beck, Schuyler, & Herman, 1974). Suicide ideators had suicidal ideation with a specific plan, but no lifetime history of suicide attempt. These participants have seriously contemplated suicide and communicated this intention to their family or medical professionals. Participants with passive death wish, or transient or ambiguous suicidal ideas were excluded from this group. Non-suicidal depressed older adults were included in the study as a psychiatric comparison group. Depressed participant had a SCID/DSM-IV diagnosis of major depression and a score of 14 or higher on the 17-item Hamilton Rating Scale for Depression (HRSD-17) (Hamilton, 1960), but no lifetime history of self-injurious behavior, suicidal ideation, or suicide attempts, based on the clinical interview, review of medical records, SCID/DSM-IV,

and a score of 0 on the HRSD-17 suicide item. (For comparing depression severity in Table 1, we report 16-item HRSD scores with the suicide item excluded). Healthy controls had no lifetime history of psychiatric disorders, as determined by the SCID/DSM-IV.

We excluded individuals with indicated dementia on the Mini-Mental State Examination (score < 24) (Folstein, Folstein, & McHugh, 1975), and those with a history of neurological disorder, delirium, or sensory disorder that would preclude neuropsychological testing. For a more fine-grained assessment of cognitive function that may differ across groups and influence social decision-making, we administered the Mattis Dementia Rating Scale (DRS) (Mattis, 1988) to assess global cognitive ability, Socioeconomic Status (SES) was assessed with the MacArthur Sociodemographic Questionnaire (MacArthur Network on SES and Health, 2010), using last year income as the SES estimate. Chronic interpersonal difficulties were measured with the Inventory of Interpersonal Problems (Morse & Pilkonis, 2007).

Social Context version of the Ultimatum Game

The UG is a classic scenario in which two individuals share a sum of money (the stake) (Guth, Schittberger, & Schwarze, 1982). One participant (the 'proposer') presents a split, for example, of a $10 stake, the proposer receives $8, and the other player receives $2. The other player (the 'responder') chooses to accept or reject the offer. If the responder accepts, the two players receive the proposed payout, but if the participant rejects, neither player receives anything. The standard behavioral observation is that individuals frequently reject unfair offers in order to punish the proposer, even though rejections entail a personal cost. Unfair offers are considered a violation of social "fairness norms" (Knoch, Pascual-Leone, Meyer, Treyer, & Fehr, 2006; Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003). In most versions of the UG, the participant plays as responder to a series of offers (some fair, some unfair) from different proposers. This 'single shot' scenario avoids strategic rejections to enhance future offers from the same partner.

We used a modified version of the UG developed by O'Callaghan et al (2016), which compriseda baseline block of 26 trials against different opponents, followed by a social context block of 52 trials in which each offer was paired with a description of the proposer designed to elicit empathic (n = 26) or punishment (n = 26) reactions. These descriptions were intended to promote pro-social (accept decisions) or anti-social (reject decisions) behavior, respectively. The empathic descriptions portrayed the partner as impoverished or 'down on their luck', for example "[NAME] can't afford to pay her medical bills"; "[NAME] is going to be evicted because she is behind on her rent"; and "[NAME] is a veteran having trouble finding employment". The O'Callaghan study presented 11 prosocial and 11 punishment scenarios. We created some new scenarios and reworded some of the original scenarios, to maximize cultural relevance. In addition, the punishment condition in the original O'Callaghan task framed proposers only as high in resources, but the effects in their punishment condition were modest, even in the healthy control group. We distinguished 13 'high resource' descriptions and 13 new 'poor reputation' descriptions. The high resource sub-condition framed proposers as wealthy to evoke a heightened sense of unfairness, for example "[NAME] is a highly paid actress", "[NAME] just won the lottery", and "[NAME] is a wealthy investment banker". By contrast, the poor reputation sub-

condition framed proposers as immoral to amplify the sense of unfairness, e.g. “[NAME] regularly fires employees to avoid promoting them”; “[NAME] used her mother’s social security number to open a credit card account”, and “[NAME] stole his elderly father’s prescription medications”.

On all trials, a photograph of the proposer was displayed (facial expressions were neutral), with the caption “[NAME] has made you an offer” for 3.5 seconds. The photo screen was followed by a decision screen showing the stake and the proposed offer, depicted using a pie chart. This screen also displayed a prompt to ‘accept or reject’ the proposed offer. The decision screen was followed by a feedback screen, e.g. “You get $4” or “You both get $0”, depending on the response made. The stake size varied from $10-$20 in order to separate fairness from reward sensitivity (Tabibnia, Satpute, & Lieberman, 2008). In our analysis, 50/50% and 60/40% splits were designated as ‘fair’ (Koenigs & Tranel, 2007; O’Callaghan et al., 2016), while 70/30%, 80/20%, and 90/10% were designated ‘unfair’. As the key behavioral questions pertained to the unfair trials, we overweighted unfair trials (20:6 per condition).

Within each UG condition, half of the presented faces were female and half were male. All face stimuli were caucasian, and the photos were of neutral expressions. Offers were paired with proposers on a random cycle, to control for the possibility that any features of a proposer (for example, physical attractiveness) might induce systematic response biases. Each participant completed the baseline block followed by the social context task. The social context condition comprised an equal number of empathy and punishment scenarios, presented in a randomized order. Participants were instructed to make their choices based on how they would act in a real-life situation. Performance was incentivized by an instruction that their choice on one trial would be honoured as a bonus payment, depending on whether that offer was accepted or rejected (Crockett, Clark, Tabibnia, Lieberman, & Robbins, 2008; Sokol-Hessner et al., 2009). All participants were compensated equally after completing both conditions.

To assess participants’ emotional reactions and fairness perceptions to the social context trials, 8 random statements that had appeared previously in the context condition were presented in a debrief questionnaire. For each statement, participants were asked to rate on a 3-point Likert scale how fair a 90/10% split offer from that particular proposer felt, how angry they were at that proposer, and how sympathetic they were toward the proposer. Scores were z-scored for analyses.

Individual Differences

The Interpersonal Reactivity Index (IRI) (Davis, 1983) was administered to assess individual differences in different facets of empathy: i) the ‘perspective taking’ subscale measures the ability to adopt another person’s point of view, ii) the ‘fantasy’ subscale measures the tendency totransfer oneself into fictitious situations, iii) the ‘empathic concern’ subscale measures the tendency to feel compassion and concern for unfortunate others, and iv) the ‘personal distress’ subscale measured experience of heightened emotional feelings to other people’s suffering. Each item is scored on a 5-point scale from “Does not describe me well”

to “Describes me well”. We assessed impulsivity with the Barratt Impulsivity Scale (BIS) total score (Barratt & Patton, 1983).

Statistical analysis

Analyses employed R 3.3. For demographic, clinical and questionnaire variables, continuous measures were compared across the four groups using analysis of variance, and categorical data were compared using chi-squared tests. All testing was two tailed. For significant differences in ANOVA, pairwise comparisons were run using Tukey’s HSD.

In our main analysis of the UG, the dependent variable was the decision to accept or reject each offer. To fully propagate variance from the trial level to the subject level, we employed hierarchical generalized linear models (R *lme4* package). Social Context, Fairness, and Stake were entered as predictors at trial level, and study group and individual differences variables at subject level. Block order was modeled as nested within subjects in the structure of random effects. Our primary hypothesis of impaired responsiveness to empathy in suicide attempters corresponded to a significant cross-level Context*Group interaction. Our analyses of each of the debrief ratings (fairness, anger, sympathy) employed a similar model.

Results

Demographic and Clinical Characteristics

The four groups did not differ significantly in age, gender, or race (Table 1). Groups differed in education, with significantly higher education in the non-psychiatric control group relative to the suicide attempter group (Tukey’s $p = .034$). There was a significant difference in SES, due to significantly higher income in the non-psychiatric control group relative to each of the three clinical groups (attempter $p <. 001$, ideator $p = .012$, depressed $p = .002$). The three depressed groups did not differ in the severity of depression (HDRS-16). On the SSI, the suicide attempter group scored higher than the suicide ideator group ($p < .001$). The average Beck Lethality Scale score in the suicide attempter group was 3.9 ($SD = 2.2$). On the cognitive measures, the four groups did not differ on the MMSE, but on the more sensitive DRS, there was a significant group difference, with the suicide attempt group showing poorer global cognition than the non-psychiatric control group ($p = .011$).

On the individual difference questionnaires, the four groups differed on impulsivity (BIS Total), with the three clinical groups each scoring higher than the non-psychiatric control group (all $p < .001$). The same pattern was observed on the Inventory of Interpersonal Problems (IIP) subscales for Sensitivity (attempter $p < .001$, ideator $p < .001$, depressed $p = .017$) and Aggression (attempter $p = .025$, ideator $p = .001$, depressed $p = .027$). On the IIP Ambivalence subscale, the significant ANOVA effect was driven by elevated scores in the suicide attempter ($p = .013$) and suicide ideator ($p = .009$) groups compared to the control group. On the IRI, the non-psychiatric control group scored significantly lower than the suicide attempter ($p = .003$) and suicide ideator ($p = .010$) on the ‘personal distress concern’ subscale, but the four groups did not differ on the ‘perspective taking’, ‘fantasy’, and ‘empathetic concern’ subscales.

Ultimatum Game: Choice Behavior

The model for 'accept' decisions on the Ultimatum Game indicated several significant main effects for task conditions. Offer acceptance/rejection was sensitive to Fairness, such that participants tended to accept fair offers (87.1% overall) and rejected 38.2% of offers of the most unfair proposals. There were main effects of the two Social Context conditions (relative to the baseline), such that participants were more likely to accept offers in the empathy condition, and less likely to accept offers in the punishment condition, as predicted. The main effects of Group and Stake were non-significant (see Table 2).

A number of 2-way interactions were observed between the task conditions. A significant Fairness * Stake interaction was observed: for unfair offers, offers with a higher stake size were more likely to be accepted, consistent with prior research on self-interest motives (Tabibnia et al., 2008). Fairness interacted with context, such that empathy scenarios induced greater acceptance of unfair offers while punishment scenarios induced greater rejection of fair offers. A Context * Stake interaction was observed for the punishment context such that the tendency toward higher rejection was tempered by higher stakes.

For the empathy manipulation, a significant Group * Context interaction was observed, in which the suicide attempters were less sensitive to the empathy context (vs baseline) than the non-psychiatric controls ($z = 2.27$, $p = .023$). The attempters were also marginally less sensitive to empathy context than the ideators (Group * Context $z = 1.85$, $p = .065$), but the attempters did not differ from the non-suicidal depressed group (this was partly due to a high baseline acceptance rate in the non-suicidal depressed group; see Figure 2). The suicide attempter group did not differ from any group in their adjustment in the punishment context (for punishment subtypes, see below).

A significant Group * Fairness interaction was observed, whereby the suicide attempters showed more adjustment as a function of fairness compared to the non-suicidal depressed controls ($z = -1.97$, $p = .049$). However, the attempters did not differ from the non-psychiatric control group or the suicidal ideator group in fairness adjustment.

Punishment Context: Reputation vs. Resources

The primary model was refitted distinguishing the two types of punishment scenarios: those that implied the proposer had high *resources* and those that implied poor *reputation*. Although the main effects of both subtypes were significant relative to the baseline block, the degree of adjustment was markedly stronger for the reputation scenarios ($z = 11.43$, $p < .001$) than the resource scenarios ($z = 2.00$, $p = .045$) (see Supplementary Figure 2). Both subtypes interacted significantly with Fairness (reputation $z = -11.57$, $p < .001$; resources $z = -7.94$, $p < .001$). Consistent with the primary analysis, there were no Group * Context interactions for the punishment subtypes (see Supplementary Table 1).

Effects of Demographic and Clinical Characteristics

The social context effects differed between the four groups, primarily in the empathy condition, but these effects were not uniquely associated with suicide attempt status. Sensitivity analyses were run to examine two questions. First, the 4 groups were unbalanced

with respect to certain demographic and clinical variables (education, SES, and global cognitive function), so controlling for these differences could serve to clarify the behavioral correlates in the suicide attempters. Including Education in the model, 3-way interactions of Group * Punishment * Education in the attempters vs. depressed groups ($z = 2.76$, $p = .006$) and attempters vs. ideators groups ($z = 1.99$,$p = .047$) indicated that group differences were greatest at lower education levels. Meanwhile the Group * Empathy interaction for attempters vs. non-psychiatric controls was diminished ($z = 1.66$, $p = .096$), indicating a lack of reliable differences at sample-average levels education (see Table 1 for group means). The Group * Fairness interaction was only marginally significant for the attempters vs. depressed groups ($z = -1.81$, $p = .061$). In an equivalent model including SES, a Group * Empathy * SES interaction was observed ($z = -2.09$, $p = .037$), indicating that the group differences in prosocial adjustment were most pronounced at lower SES levels, whereas the Group * Empathy interaction was no longer significant for attempters vs. non-psychiatric controls ($z = 1.42$, $p = .156$) indicating a lack of reliable differences at the sample-average level of income. The Group * Fairness interaction remained significant for the attempters vs. depressed groups ($z = -1.96$, $p = .050$). Finally, including global cognitive functioning (DRS) in the model, the Group* Fairness interaction remained significant for the attempters vs. depressed non-suicidal groups ($z = -2.45$, $p = .014$); the Group * Empathy interaction was significant for attempters vs. ideators ($z = 2.19$, $p = .029$) but was no longer significant for attempters vs. non-psychiatric controls ($z = 1.60$, $p = .111$).

Second, given the acknowledged heterogeneity of suicidal behaviour, investigation of individual differences with established relevance to suicidality (SSI, BIS impulsivity, IRI Empathic Concern) could provide dimensional evidence in support of the between-group categorical comparisons. In these models, we were specifically interested in the interactions of the covariate with context and group. Including IRI Empathic Concern as a predictor in the UG model, the main effect term for IRI Empathic Concern was not significant ($z = .04$, $p = .970$). The interaction terms of IRI Empathic Concern * Context interactions were not significant (empathy $z = 0.59$, $p = .556$; punishment $z = -0.20$, $p = .843$), and there were no significant interactions of IRI Empathic Concern * Group * Context (all $p > .100$). Including BIS Impulsivity as a predictor, its main effect was not significant ($z = -0.63$, $p = .532$). BIS * Context interactions were not significant (empathy $z = 1.17$, $p = .243$; punishment $z = 1.00$, $p = .316$), and higher-order interaction terms with BIS were not significant (all $p > .100$).

Ultimatum Game: Fairness Ratings

Debrief ratings were obtained from the empathy, punishment reputation and punishment resources scenarios. For the rating of fairness (at receiving a 90/10% unfair offer from that proposer), the suicide attempter group gave lower ratings of fairness in the Empathy condition, compared to the non-psychiatric comparison group (vs Reputation $t = -4.03$, $p < .001$; vs Resources $t = -2.34$, $p = .019$) and compared to the suicidal ideator group (vs Reputation $t = -3.23$, $p = .001$; Figure 3). For the ratings of Sympathy and Anger, strong main effects of Context, driven by elevated Sympathy and diminished Anger in the Empathy condition compared to the two punishment conditions, did not differ across groups (see Table 3).

Discussion

We investigated whether suicidal behavior was associated with altered responses to unfairness as a function of social context, using a modified version UG task in older adults with prior suicide attempt, suicidal ideation (without attempt), non-suicidal depression, and non-psychiatric controls. Participants played as the responder in a series of single-shot ultimatums, where on some trials, social information intended to elicit empathy or punishment was provided on the proposer (O'Callaghan et al., 2016). We observed a bidirectional effect of the social context scenarios, such that participants accepted more offers in the empathy condition, and fewer offers in the punishment condition, compared to the baseline trials. Within the punishment condition, offers from proposers with poor reputation were more likely to be rejected than those from proposers with high resources. Acceptance rates also scaled with offer fairness and to a lesser extent, stake size, as seen previous studies on the UG (Crockett et al., 2008; Koenigs & Tranel, 2007; Tabibnia et al., 2008). These effects serve as manipulation check for our novel version of the UG. Our main finding was that the suicide attempters' choices were less influenced by empathy-eliciting scenarios, with a significant difference relative to the non-psychiatric control group, and marginally against the ideator group. Sensitivity analyses indicated that these differences were only detectable at lower levels of education and per capita income. The results in the primary model were corroborated by the fairness ratings (of unfair offers), for which the suicide attempter group showed significantly less discrimination of the empathy and punishment scenarios compared to both the non-psychiatric control and ideator groups. No group differences were seen in anger and sympathy ratings, suggesting that the blunting of behavioral empathy in suicide attempters was due to altered fairness perceptions rather than general affects influencing cooperation.

The group differences were specific to the empathy context rather than the negative social (punishment) contexts. This asymmetry could be due to a differential effectiveness of our conditions, however we augmented the earlier version of the task (O'Callaghan et al., 2016) by including two subtypes of punishment scenarios, involving either 'high resource' or 'poor reputation' descriptions. The 'poor reputation' scenarios were more behaviorally effective in promoting offer rejection than the high resource scenarios, across all groups. There were no group differences in punishment sensitivity, even when separating out the 'poor reputation' and 'high resource' subtypes. We note that the 'high resource' scenarios may induce a conflict in the responder, between selfish motives and status-seeking. By presenting the proposer as immoral, these motives align in the 'poor reputation' scenarios.

This asymmetry in the group differences between the two social contexts indicates a specific blunting of empathy in the suicide attempter group. This finding is consistent with our hypothesis that impaired behavioral empathy undermines social deterrents to suicide. It is qualified, however, by the lack of significant differences between suicide attempters and non-suicidal depressed groups in the primary model. This may be explained by unexpectedly high acceptance rates in the baseline condition among the non-suicidal depressed, which was evident in a significant Group x Fairness interaction between the attempters and non-suicidal depressed. The alternative interpretation that the suicide attempter group were perhaps more sensitive to offer fairness seems unlikely as the attempter group did not differ from either the

non-psychiatric control or ideator groups in these interactions. At the same time, our findings are consistent with the large literature on the role of interpersonal dysfunction and conflict in suicidal behavior across the lifespan (Harrison et al., 2010; Johnson et al., 2002; Waern, Rubenowitz, & Wilhelmson, 2003). Importantly, empathic responses are enhanced by feelings of attachment security (Mikulincer et al., 2001), suggesting that the isolation and distress that characterize the suicidal crisis may undermine consideration of the impact of one's suicide on family and friends.

Our project was inspired by neuropsychological investigations of the UG in patients with pathology affecting the vmPFC. This is predicated upon a substantial body of research implicating vmPFC dysfunction in suicide. Similar to the suicide attempter group described here, patients with bvFTD were unaffected in their responses to unfair offers in the absence of social information, but showed reduced sensitivity to the empathy-eliciting information (O'Callaghan et al., 2016). Reduced empathic concern is a hallmark of bvFTD. In cases with overt lesions to vmPFC, intact performance on the classic UG has also been reported, in conjunction with reduced differentiation based on another contextual cue, whether the proposer was a human or computer opponent (33). These results highlight how basic reactions to inequity and unfairness may rely on relatively simple social computations, while the demand to integrate selfish aversion to unfair offers with information about social context recruits brain regions implicated in computing subjective value.

In the O'Callaghan et al (2016) study, low informant ratings of empathic concern of the Cambridge Behavioral Inventory-Revised predicted reduced UG acceptance rates, but did *not* interact with the degree of adjustment to the empathy scenarios. In our study, we used a self-report measure, the IRI, given difficulties obtaining informant data in this group of individuals characterized by social isolation. We observed group differences on the IRI 'personal distress' subscale but not on the 'empathetic concern' subscale, which also did not interact with social context in predicting UG behavior. Self-reported empathy may be biased in a way that scales with personality and emotional intelligence (Thoma et al., 2011), which may explain the divergent findings for behavioral performance measures. Whether the affective response to others' need or suffering results in prosocial behavior further depends on cognitive resources and attachment style (Decety & Svetlova, 2012).

Some limitations should be noted. In our prior study (Szanto et al., 2014), a subgroup of suicide attempters with high medical lethality attempts were insensitive to the monetary cost of rejecting high stake (i.e. magnitude) reward, in contrast to the other groups. Although we failed to replicate a Stake * Group interaction, the further inclusion here of the social context trials traded off sensitivity to stake size against the social context manipulation. Overall, rejection rates of unfair offers were somewhat lower compared to past studies, most likely as a consequence of the change in base rates. Like O'Callaghan et al, we randomized the presentation of the social context scenarios, but the baseline UG trials were completed in an initial block. Our model controlled for this effect of time within participants, but a fully randomized design would be advantageous for functional imaging, for example. The baseline trials were also simpler and could be enhanced with inclusion of non-social contextual detail. Finally, our case-control study cannot rule out the alternative explanation that blunted empathy in suicide attempters is epiphenomenal to attachment problems, early

maltreatment, or other developmental problems, which in turn may play a causal role in suicidal behavior.

In summary, our findings support the hypothesis that blunted behavioral empathy – particularly in the setting of social conflict – may undermine social deterrents to suicide. While the role of blunted empathy in suicidal behavior requires confirmation, it may have important implications for suicide risk management as well as psychotherapy with suicidal patients. To the extent that these experimental observations are representative of prosocial behavior in real life, they raise the question of whether empathy training (Teding van Berkhout & Malouff, 2016) has the potential of enhancing social deterrents to suicide.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Social context influences acceptance of unfair offers on an Ultimatum Game.
- Older adults with past suicide attempts showed a blunted response to empathy scenarios.
- Suicide attempters displayed intact sensitivity to offer fairness.

Figure 1.

Screenshots of the Ultimatum Game displays depicting a single trial in the baseline (no context) block, the punishment (reputation) context, and the empathy context.

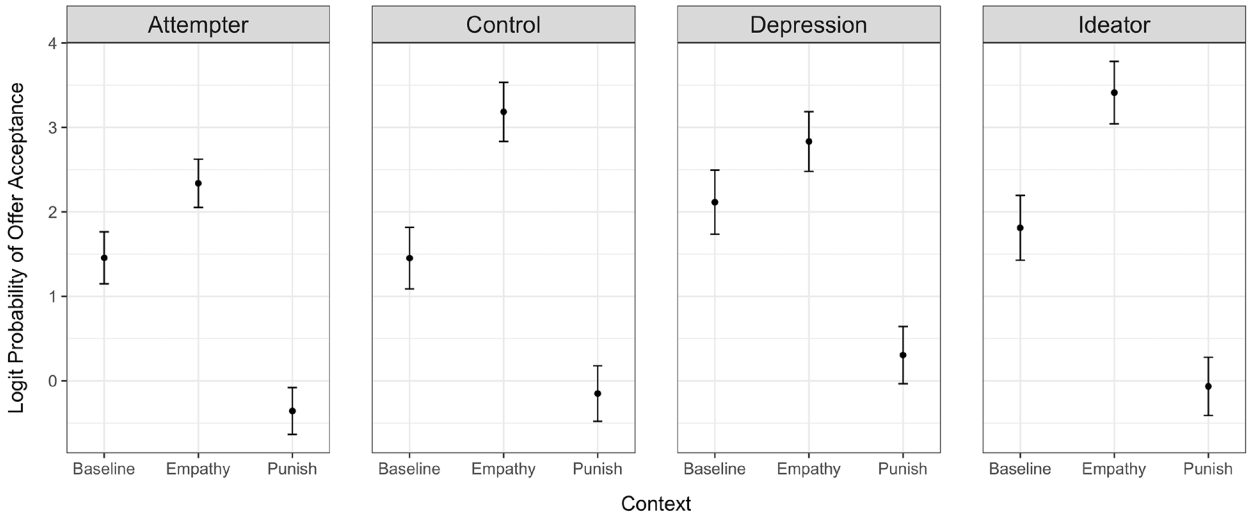

Figure 2:

Group differences in Ultimatum Game offer acceptance rates (estimated marginal mean from a generalized linear mixed-effects model) as a function of social context. Error bars indicate standard error of the model-predicted value.

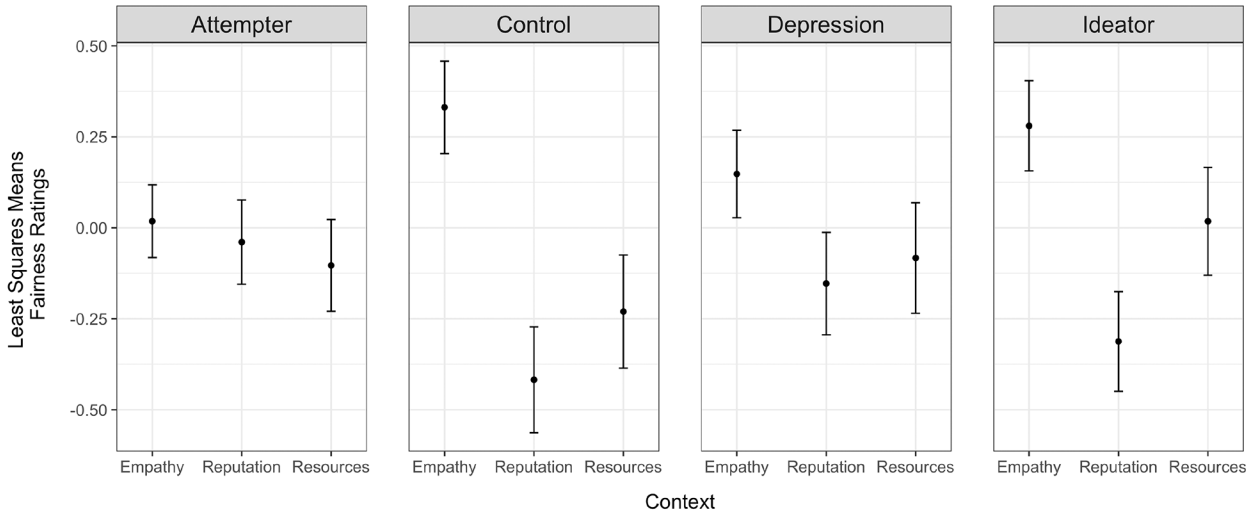

Figure 3:

Group differences in Ultimatum Game debrief fairness ratings (estimated marginal mean from a linear mixed-effects model) as a function of social context, distinguishing the Punishment context in the two subtypes of Reputation and Resources. Error bars indicate standard error of the model-predicted value.

Table 1:

Demographics and Individual Characteristics. Mean (SD)

Predictors	Control (C) *n=35*	Depression (D) *n=33*	Ideator (I) *n=32*	Attempter (A) *n=49*	N	*p-value*	*Pairwise*
Age	63.5 (8.7)	63.0 (7.8)	60.4 (6.0)	62.3 (8.5)	149	0.432	
% Male	40%	51.50%	56.20%	51%	149	0.584	
% White	88.60%	72.70%	87.50%	83.70%	149	0.331	
Education	15.7 (2.7)	15.1 (2.6)	15.3 (2.2)	14.1 (2.9)	149	0.038	C > A
SES (x $1000)	36.5 (21.2)	20.9 (16.6)	23.3 (20.7)	18.2 (11.5)	149	<0.001	C > A, D, I
BLS	NA	NA	NA	3.9 (2.2)	49	NA	NA
HRSD - 16	NA	15.9 (6.0)	17.8 (7.0)	17.9 (8.5)	114	0.46	
SSI	NA	NA	15.4 (5.7)	21.2 (7.6)	81	<0.001	A > I
MMSE	28.9 (1.1)	29.0 (1.0)	29.0 (1.4)	28.4 (1.8)	149	0.169	
DRS	138.2 (3.4)	135.8 (5.1)	137.2 (3.9)	135.2 (4.7)	143	0.012	C > A
IRI							
Perspective Taking subscale	18.2 (4.6)	16.1 (5.1)	17.2 (6.7)	16.6 (4.6)	143	0.391	
Fantasy subscale	11.5 (4.5)	10.6 (5.9)	11.0 (5.1)	11.8 (5.4)	143	0.772	
Empathetic Concern subscale	21.5 (3.8)	20.0 (4.6)	21.0 (4.5)	21.6 (3.9)	143	0.363	
Personal Distress Subscale	6.6 (3.9)	8.8 (4.2)	10.6 (6.6)	10.6 (5.1)	143	0.002	C < A, I
IIP							
Ambivalence	2.9 (3.7)	4.4 (3.5)	6.6 (4.8)	6.0 (5.3)	142	0.004	C < A, I
Sensitivity	3.2 (3.1)	6.5 (4.3)	8.4 (5.4)	8.0 (4.5)	142	<0.001	C < A, D, I
Aggression	1.6 (2.5)	4.5 (3.3)	5.2 (4.2)	3.9 (3.7)	142	0.001	C < A, D, I
BIS Total	31.0 (9.7)	46.2 (15.8)	46.0 (12.8)	49.4 (17.4)	142	<0.001	C < A, D, I

Note: SES = Household Income Per Capita; BLS = Beck Lethality Scale; HRSD = Hamilton Rating Scale for Depression - 16 (without the Suicide item); SSI = Scale of Suicide Ideation; MMSE = Mini Mental Status Exam; DRS = Dementia Rating Scale; IRI = Interpersonal Reactivity Index; IIP = Inventory of Interpersonal Problems; BIS = Barratt Impulsivity Scale. The HRSD comparisons excluded the non-psychiatric control group, and the SSI comparisons excluded the non-psychiatric control group and depressed non-suicidal group.

Table 2.

Model of reappraisal context, offer fairness, and stake size on Ultimatum Game offer acceptance among the 4 groups of participants. The reference categories were Suicide Attempters (for Group) and the baseline UG block (for Social Context).

	Predictors	Coefficient	Std. Error	*z*	*p-value*
Main effects	Empathy	0.88	0.24	3.70	<0.001
	Punish	−1.81	0.23	−7.85	<0.001
	Fairness	2.10	0.09	23.44	<0.001
	Stake	0.03	0.06	0.42	0.675
	Controls vs. attempters	0.00	0.47	−0.01	0.995
	Depressed vs. attempters	0.66	0.49	1.36	0.174
	Ideators vs. attempters	0.36	0.49	0.73	0.466
Group × Condition interactions					
Controls vs. attempters	**Empathy**	**0.85**	**0.38**	**2.27**	**0.023**
	Punish	0.21	0.36	0.59	0.557
	Fairness	0.08	0.09	0.95	0.344
	Stake size	−0.15	0.08	−1.91	0.056
Depressed vs. attempters	**Empathy**	**−0.16**	**0.38**	**−0.43**	**0.665**
	Punish	0.00	0.37	0.01	0.994
	Fairness	−0.17	0.09	−1.97	0.049
	Stake size	−0.09	0.08	−1.12	0.263
Ideators vs. attempters	**Empathy**	**0.72**	**0.39**	**1.85**	**0.065**
	Punish	−0.06	0.37	−0.17	0.862
	Fairness	0.12	0.09	1.31	0.191
	Stake size	−0.06	0.08	−0.75	0.455
Context × Fairness	Empathy × Fairness	−1.27	0.10	−13.05	<0.001
	Punish × Fairness	−1.25	0.09	−13.96	<0.001
Context × Stake	Empathy × Stake	0.08	0.08	1.01	0.313
	Punish × Stake	0.19	0.07	2.77	0.006
Fairness × Stake	Fairness × Stake	−0.14	0.06	−2.25	0.025
Context × Fairness × Stake size	Empathy × Fairness × Stake	0.15	0.09	1.82	0.069
	Punish × Fairness × Stake	0.07	0.08	0.91	0.362
Intercept		1.46	0.31	4.74	<0.001

Note: the omnibus analysis of deviance test for the Group × Context interaction was significant ($\chi^2 = 26.29$, $p < .001$). Terms of *a priori* interest are bolded.

Table 3.

Subjective ratings of Fairness, Sympathy, and Anger from the debrief questionnaire, as a function of social context (empathy, resources, reputation) in the 4 groups of participants. Reference Group: Suicide Attempters. Reference context: Empathy

		Predictors	Estimate	Std. Error	*t*	*p-value*
	Main effect	Reputation (vs. Empathy)	1.66	0.08	19.98	<0.001
		Resources	0.52	0.09	5.64	<0.001
		Control	0.05	0.12	0.39	0.695
		Depression	0.01	0.12	0.11	0.914
		Ideator	0.02	0.12	0.21	0.837
	Group × Condition interactions					
Anger	Controls vs. Attempters	Reputation	−0.16	0.14	−1.21	0.226
		Resources	−0.16	0.15	−1.10	0.273
	Depressed vs. Attempters	Reputation	−0.16	0.13	−1.24	0.217
		Resources	−0.23	0.14	−1.59	0.112
	Ideators vs. Attempters	Reputation	−0.16	0.13	−1.22	0.224
		Resources	−0.11	0.14	−0.78	0.438
	Intercept		−0.54	0.07	−7.38	<0.001
	Main effect	Reputation	−1.38	0.08	−17.04	<0.001
		Resources	−1.32	0.09	−14.65	<0.001
		Control	−0.07	0.10	−0.65	0.514
		Depression	0.07	0.10	0.87	0.385
		Ideator	0.08	0.10	0.81	0.417
	Group × Condition interactions					
Sympathy	Controls vs. Attempters	Reputation	−0.04	0.13	−0.30	0.762
		Resources	0.06	0.14	0.39	0.700
	Depressed vs. Attempters	Reputation	0.00	0.13	0.02	0.984
		Resources	−0.15	0.14	−1.05	0.292
	Ideators vs. Attempters	Reputation	−0.15	0.13	−1.15	0.253
		Resources	−0.21	0.14	−1.61	0.108
	Intercept		0.68	0.06	10.67	<0.001
	Main effect	Reputation	−0.06	0.11	−0.54	0.588
		Resources	−0.12	0.12	−1.04	0.300
		Control	0.31	0.16	1.94	0.054
		Depression	0.13	0.16	0.83	0.407
		Ideator	0.26	0.16	1.65	0.101
Fairness	**Group × Condition interactions**					
	Controls vs. Attempters	**Reputation**	**−0.69**	**0.17**	**−4.03**	**<0.001**
		Resources	−0.44	0.19	−2.34	0.019
	Depressed vs. Attempters	**Reputation**	**−0.24**	**0.17**	**−1.47**	**0.142**
		Resources	−0.11	0.18	−0.60	0.549
	Ideators vs. Attempters	**Reputation**	**−0.54**	**0.17**	**−3.23**	**0.001**

	Predictors	Estimate	Std. Error	*t*	*p-value*
	Resources	−0.14	0.18	−0.78	0.438
Intercept		0.02	0.10	0.18	0.856

Note: the omnibus term of Group × Condition interaction were not significant for the Anger rating (χ^2 = 4.21, p = .648) and the Sympathy rating (χ^2 = 5.53, p = .477), but was significant for the Fairness rating (χ^2 = 21.72, p = .001). Terms of *a priori* interest are bolded (here, the stronger contrast between empathy and reputation conditions).