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## RESEARCH ARTICLE

### Reflective Function as a Mediator between Childhood Adversity, Personality Disorder and Symptom Distress<sup>1</sup>

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#### ABSTRACT

A growing body of literature has indicated the central role of childhood adversity for the development in later life of personality disorder (PD) and psychiatric distress. In this investigation we examine the role of reflective function (RF) as a mediator between childhood adversity, subsequent development of PD and psychiatric morbidity. We tested the hypothesis that adversity leads to decreased RF, which in turn is associated with PD, and both increase the likelihood of psychiatric distress. The study sample consisted of 234 individuals, drawn from a clinical PD group (n=112) and one demographically matched non-psychiatric group (n=122) using a shared battery of measures, which included the Structured Clinical Interview for DSM-IV, the Symptom Checklist-90-R and the Adult Attachment Interview, which was used to assess RF levels. The results indicated that childhood adversity predicted low level of RF, which in turn was associated with PD onset later in life. A combination of different early adverse experiences had a significantly greater impact on lowering RF scores than experiencing either neglect or abuse alone. Mediation analyses confirmed that RF was a significant mediator between adversity and PD diagnoses and between adversity and psychiatric distress

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**KEYWORDS:** attachment, personality disorder, reflective function, childhood adversity, sexual and physical abuse, neglect, psychiatric distress, mediation analysis

## Introduction

Both non-twin family studies (Gunderson et al., 2011; Walter et al., 2009; White, Gunderson, Zanarini, & Hudson, 2003) and a number of twin studies (Bornovalova, Hicks, Iacono, & McGue, 2009; Distel, Hottenga, Trull, & Boomsma, 2008; Kendler et al., 2008; Torgersen et al., 2008) have indicated that hereditary factors are present in determining personality disorder (PD). However, a large body of literature has consistently indicated a key role for environmental experiences in the etiology of PD. The combination of genetic factors and early adversity in the etiology of borderline personality disorder (BPD) may suggest a diathesis–stress model, implying an interaction between a child’s genetic vulnerability and adverse experiences in the family environment (Crowell et al., 2005; Fonagy, 2000; Gunderson & Lyons-Ruth, 2008; Paris, 2005; Steele & Siever, 2010; Zanarini & Frankenburg, 2007).

Several retrospective (Battle et al., 2004; Zanarini, 2000) and prospective studies have confirmed that childhood adversity is highly predictive of later onset of PD. The New York longitudinal study found that BPD was associated with low levels of parental affection and nurturing, and with aversive parental behaviours, such as harsh punishment (Johnson, Cohen, Chen, Kasen, & Brook, 2006). A smaller prospective study reported that disrupted maternal communication in infancy and later experiences of abuse in adolescence contributed to the prediction of symptoms of borderline pathology at age 18 (Lyons-Ruth, Yellin, Melnick, & Atwood, 2005). A further study (Crawford, Cohen, Chen, Anglin, & Ehrensaft, 2009) followed up individuals from adolescence and found that symptoms of BPD declined with age, but the rate of decline was moderated by experience of early maternal separation, with individuals separated before the age of 5 showing slower rates of decline. A large prospective study, investigating the association between maladaptive

parenting and BPD symptoms at age 11, found that family adversity predicted BPD pathology (Winsper, Zanarini, & Wolke, 2012)

Several studies using the Adult Attachment Interview (AAI) have examined the association between attachment states of mind and a diagnosis of PD, particularly BPD and antisocial personality disorder (Barone, 2003; Fonagy et al., 1996; Patrick, Hobson, Castle, Howard, & Maughan, 1994; Stalker & Davies, 1995; Stovall-McClough & Cloitre, 2003). The results of these studies consistently indicate that the attachment representations of individuals with PD are unresolved in relation to trauma and loss (Dozier, Stovall-McClough, & Albus, 2008). 89% of individuals with BPD diagnosis were coded as unresolved in one study (Fonagy et al., 1996) and 75% in another (Patrick et al., 1994).

An epidemiological study by Hill and colleagues (2011) demonstrated that attachment was specifically related to BPD symptoms, which mediated the association with dysfunctional romantic relationship.

Thus, substantial evidence has demonstrated that experiences of loss and trauma, often referred in combination as early adversity, have a disrupting impact on internal representations, causing disorganized attachment which is associated with BPD symptoms later in life. This clearly occurs along a developmental path where social adversity in the family context brings about disorganization in the attachment system causing emotional dysregulation, which is a hallmark of BPD (Linehan, 1987; Steele & Siever, 2010). One of the best-documented longitudinal studies to date found borderline personality symptoms measured at 28 years to be strongly predicted by adversity associated with disorganized attachment behaviour (12–18 months), maternal hostility (42 months), family disruption related to the father's presence (12–64 months) and family life stress (3–42 months) (Sroufe, 2005). Crucially, these factors combined in creating disturbances in self-representation in early adolescence that may mediate the link between

disruption of attachment and PD. In a mediation analysis, the authors found evidence for the role of self-representation as the link between early adversity and later borderline features. A composite measure of 'abuse' (early adversity) predicted both attachment disorganization and the adolescent composite self-index scores. The relationship between early unfavourable experience and BPD symptoms was accounted for by adolescent dysfunctional self-representations. The same authors concluded that "representations and related mentalizing processes are viewed as the carriers of experience that link early attachment to later psychopathology" (Carlson, Egeland, & Sroufe, 2009)(p. 1328).

The present investigation aimed to examine the role of mentalization as a mediator between childhood adversity (neglect, loss, maltreatment and sexual abuse), subsequent development of PD diagnoses and psychiatric distress, using a measure of mentalizing based on the Adult Attachment Interview (AAI). A clinical approach rooted in attachment theory (mentalization-based treatment-MBT) has emphasized the potentially important role that the disorganized representation of mental states may play in the phenomenology of PD (Bateman & Fonagy, 2010). Earlier studies have shown that BPD was associated with low reflective function (RF) scores (Fonagy, Steele, Steele, & Target, 1998) in a sample of hospital in-patients (Fonagy et al., 1996). RF assesses the quality of self and other representations in an attachment context in terms of the extent to which these relationship representations are made coherent and understandable by being imbued with mental-state language.

The link between childhood adversity and poor mentalizing, measured as low RF, can be accounted for by a reduced motivation, and phobic avoidance, to organize relationship representations, focusing on mental states as a result of experiences of lack of care or, more dramatically, maltreatment or abuse (Fonagy & Luyten, 2009). At the other extreme, in some individuals experiences of childhood adversity would make them excessively

concerned with the mental states of others, leading them to be inaccurate in their identification of others' mental states. Both of these tendencies are measured by a specially created scale to be used in conjunction with the AAI, the Reflective Function Scale (RFS). Previous studies have established that low scores on this measure are associated with PD, particularly in individuals with a history of childhood adversity (Fonagy et al., 1996). Early neglect has been found to be an important predictor of PD, because it developmentally undermines the normal emergence of mentalizing, thus making these individuals specifically vulnerable to later interpersonal (attachment) trauma (Allen, 2012).

Symptoms of PD reflect poor mentalizing in both frequent unwarranted assumptions about the mental states of other (hyper-mentalizing) or concrete thinking where excessive significance is given to subjective experiences (Ghiassi, Dimaggio, & Brune, 2010; Harari, Shamay-Tsoory, Ravid, & Levkovitz, 2010; Preissler, Dziobek, Ritter, Heekeren, & Roepke, 2010). A recent study of adolescents with BPD found hyper-mentalizing linked to borderline symptoms via emotion dysregulation (Sharp et al., 2011). There is accumulating evidence that therapeutic efforts at addressing mentalizing deficits result in a reduction of borderline symptoms, particularly self-harm and depression (Bateman & Fonagy, 2008; Bateman & Fonagy, 2009). Further, a path analytic study showed that changes in a measure of mentalizing and attachment may mediate the benefit of MBT in self-harming adolescents (Rossouw & Fonagy, 2012).

We consider failure of mentalising (social cognition) to be a vulnerability factor for a range of psychopathologies, particularly personality disorder. As Rutter pointed out over 20 years ago, all types of personality disorders entail dysfunctional interpersonal relationships (Rutter, 1987). It is also widely recognised that social adversity (trauma) is present in several PDs beyond BPD (Paris, 2000). While the association of BPD and low RF linked to

trauma has been shown (Fonagy et al., 1996), the relevance of RF for non-BPDs has not yet been demonstrated.

In this study we aim to replicate the findings of previous studies that showed childhood adversity as a predictor of low RF, which in turn was found to increase the likelihood of PD diagnosis and psychiatric distress. Also, we test the hypothesis that the association between adversity and PD diagnoses and psychiatric distress will be mediated by RF scores in a broad range of personality disorders, since in the literature this pathway has been mostly explored in borderline PD. In addition, we investigate the possible cumulative impact of early adverse experiences, which we hypothesise as having an additive impact on level of mentalization. Our hypothesized model is that childhood adversity decreases RF, which in turn is associated with personality disorder. The combination of personality disorder and low RF increase the likelihood of high psychiatric distress.

## **Method**

### **Study sample**

The sample consisted of 112 patients recruited from the Cassel Personality Disorder Study (Chiesa, 2000; Chiesa, Fonagy, & Holmes, 2006) and 122 non-psychiatric participants, matched on age and gender, recruited from medical and surgical departments of a metropolitan general hospital. Consecutively admitted patients were approached by a research assistant who sought informed consent to participate in the study. All measures were applied at intake within one month of admission, with a median delay from admission of ten days. Treatment was unlikely to impact on the subjects' response to the intake battery of measures.

The psychiatric sample included patients with at least one DSM-IV primary diagnosis of PD admitted for specialist psychosocial treatment ( $n=72$ ) at a PD Tier 4 specialist service

(Cassel Hospital) and from psychiatric services located in a rural area in the south of England ( $n = 40$ ).

All patients gave informed written consent to meet trained researchers for the administration of the AAI and the other measures of the battery.

## **Measures**

Information regarding experiences of childhood neglect and abuse were collected at intake into the study by a research psychologist and a senior psychiatrist using a structured interview (*the Cassel Baseline Questionnaire*) (Chiesa & Fonagy, 2000). Childhood neglect (0-16 years) was defined as lack of parental support indicated by prolonged (> 1 year) separation from a primary caregiver (normally the mother or father), including permanent loss of the caregiver through death. While this is a probabilistic indicator of neglect, which is hard to estimate from retrospective accounts, our wish was to be as far as possible independent of the individual's personal narrative regarding experiences of neglect and attempt to establish the likely objective status of the child not receiving expected levels of parental care (Brown & Harris, 1989; Brown, Harris, & Bifulco, 1986). We recognize that loss may not necessarily engender neglect and that neglect may very well occur in the absence of loss, and that the former is a far more complex construct than the latter. Further, it could be argued that the neglect scale of the AAI may be a more valid indicator. The reason for us not using the AAI neglect scale was because we were mindful of the possibility that interviews rated as low in reflective function in RF would be more likely to present childhood experiences as neglectful, thus creating a built in correlation due to the shared source of information. Sexual abuse was defined as the participant's report of pre-adolescent (normally under 14) sexual contact with an adult or forced and violent sexual assault including post-puberty. Physical abuse was defined as bodily maltreatment by caregivers of sufficient intensity and severity to leave bruising or other



significant marks. Thus, chastisement such as smacking or slapping would not normally constitute physical abuse. These definitions are in line with those suggested in the Childhood Experiences of Care and Abuse Interview coding system (Bifulco, Brown, & Harris, 1994). A binary variable 'childhood adversity', when either neglect or abuse was present, was created in order to carry-out the mediation analysis.

The *Structured Clinical Interview for DSM-IV* (First, Gibbon, Spitzer, Williams, & Benjamin, 1997) was used to obtain diagnostic Axis-II profiles based on the criteria of the Diagnostic and Statistical Manual for mental disorders version IV (American Psychiatric Association, 1995), which yields 11 different categories of personality disorder diagnoses. The average number of personality disorders patients met criteria for in the sample was used in the mediation analyses. As previously reported, satisfactory inter-rater reliability was found in the application of the SCID interviews (Chiesa, Fonagy, Holmes, & Drahorad, 2004).

The *Symptom Checklist-90-R* (Derogatis, 1983), a four-point self-report clinical rating scale, was used to elicit symptoms in nine areas of the patient's functioning. The SCL-90-R general severity index (GSI) was the total score used in the study to report changes in the domains of subjective symptomatic distress.

The *National Adult Reading Test* (Nelson, 1982), which consists of a list of 50 words printed in order of increasing difficulty, was used to obtain intelligent quotient equivalents.

The *Adult Attachment Interview* (George, Kaplan, & Main, 1985) is a semi-structured interview that focuses on the individual's childhood experiences and relationship with his/her primary caregivers. It is considered as the gold standard measure of adult attachment, with outstanding psychometric properties (Hesse, 2008). Participants are asked to provide a description of their relationship with their parents, with probes regarding emotional upsets as a child, as well as issues related to separation from parents, feelings of rejection, feelings of being frightened or worried as a child, occurrence of experience of abuse, significant losses through death, and occurrence of possible traumatic experiences.

Finally, the individual is asked to evaluate the impact of these early experiences on their adult personality and offer a possible explanation for the caregivers' behaviours in the past. Changes in the relationship with caregivers since childhood and the perceived impact of past experiences on the individual's relationship with his/her own child are also explored. The AAI has been extensively used in psychotherapy research, and reliable links with psychopathology have been established for depression, BPD and posttraumatic stress disorder (Steele, Steele, & Murphy, 2009). The interview has been extensively used to study the impact of a personal history of adversity, including extreme traumatic experiences (Steele, 2003).

The AAI transcripts were sent to two independent raters of established reliability (Levy et al., 2006), who scored them using the *Reflective Functioning Scale* (Fonagy et al., 1998). This is an 11-point scale used to evaluate the quality of mentalizing manifested in the transcripts; it is specific to mentalizing in the context of attachment relationships. The RFS ranges from -1 (negative RF, in which interviews appear explicitly antagonistic to thinking about mental states) through +1 to 3 (interviews show concrete or excessively detailed, low-level mentalization, with distortions of the mental states of others), to 5 to 9 (interviews show increasingly complex, elaborate, or insightful reasoning about mental states). Coders were blind to the clinical status of the sample.

### **Statistical analysis**

Chi-squared tests for categorical variables and one-way ANOVAs for continuous variables were used to test differences between the samples in demographics, risk factors and clinical variables. Linear correlations were carried out to test for significant associations between pooled key variables in the three samples.

Separate logistic regressions were used to test whether experiences of sexual abuse, physical abuse and neglect and RF levels (independent variables) were predictors of

personality disorder (outcome variable). Multiple linear regressions were employed to test whether experiences of abuse and neglect and levels of RF were predictive of self-reported severity of psychiatric symptoms (GSI). In addition, multiple linear regressions were used to test whether abuse and neglect predicted levels of RF. All regressions controlled for marital status as a covariate. We also contrasted borderline PD versus non-borderline PD, and explored if the same model applied equally to both these different PD groups.

In order to test the hypothesis that RF mediates the relationships between childhood adversity and subsequent development of PD and increased symptom distress in later life, we carried out two mediation analyses with the number of PD diagnoses and GSI, respectively, as dependent variables, adversity as the independent variable and reflective functioning as the potential mediating variable, controlling for marital status as the only demographic variable significantly associated with RF scores. We used PROCESS (Hayes & Matthes, 2009) as the computational tool to carry out the mediation analyses. In addition to estimating the coefficients of the model, in either ordinary least squares regression or maximum likelihood logistic regression, PROCESS generated direct and indirect effects in mediation models with multiple mediator variables specified to operate in a sequence. All analyses were carried out using SPSS for Windows version 19.

## **Results**

### **Demographics, risk factors and reflective functioning**

Table 1 shows the demographic and clinical features of the total PD (n=112), borderline PD (n=73), non-borderline PD (n=39) and control samples (n=122). While the total PD and control groups were well matched on age, gender and race, there were significant differences in marital status ( $\chi^2_{(1)}=27.09, p<0.001$ ) and intelligence quotient equivalent

( $t_{(225)}=2.38, p<0.05$ ). The BPD sample was significantly younger than the non-BPD group ( $t_{(110)}=2.59, p<0.02$ ). With regard to risk factors, as expected the PD samples were found to have experienced significantly higher incidences of neglect ( $\chi^2_{(1)}=53.11, p<0.001$ ) and sexual and physical abuse ( $\chi^2_{(1)}=88.80, p<0.001$ ) compared with the non-psychiatric sample. A significantly higher percentage of patients with a borderline PD reported experiences of neglect and abuse than non-borderline PD ( $\chi^2_{(1)}=4.36, p<0.04$ , and  $\chi^2_{(1)}=4.24, p<0.04$ , respectively). As expected, the PD samples had significantly higher levels of psychiatric morbidity, as shown by markedly higher mean scores on the SCL-90-R GSI ( $t_{(232)}=16.46, p<0.001$ ). While the non-psychiatric sample was confirmed as not meeting criteria for any of the DSM-IV PDs, all patients in the PD sample met criteria for at least one PD ( $t_{(232)}=22.52, p<0.001$ ). Co-morbidity between Axis-II diagnoses was high, with a mean of 3.4 diagnoses per patient. Within the PD sample, 73 (65%) patients met criteria for BPD, with 39 patients being diagnosed as suffering from a non-borderline PD. The most represented PD diagnoses in this latter group were avoidant PD, PD not otherwise specified, paranoid PD and obsessive-compulsive PD.

Regarding levels of RF the PD sample had significantly lower levels of mentalizing capacity than the non-psychiatric sample ( $t_{(232)}=-7.87, p<0.001$ ). In a UNIVARIATE analysis of variance, controlling for age and marital status, the difference in RF between the three groups was highly significant ( $F_{(2)}=17.62, p<0.001$ ), and the Bonferroni adjusted pairwise comparisons yielded significant differences between both the PD samples and non-psychiatric control groups (both  $p<0.001$ ), but no significant difference between the BPD and non-BPD groups ( $p=1.00$  ns).

A correlation analysis of pooled key variables in the samples showed that of the demographic variables, only marital status was significantly associated with RF ( $r_{(234)}=-0.43, p<0.001$ ). As marital (single) status was also strongly correlated with the presence of

PD ( $r_{(234)}=-0.34, p<0.001$ ), the association with RF is more likely to be attributable to the clinical condition. On examining this association in the PD and non-PD samples separately, we found a significant association between RF and ever being married ( $r_{(122)}=0.55, p<0.001$ ) in the non-PD sample, but not in the PD sample ( $r_{(112)}=0.10, NS$ ). Significant associations were found between level of RF and PD ( $r_{(234)}=-0.71, p<0.001$ ), borderline PD ( $r_{(234)}=-0.32, p<0.001$ ), non-borderline PD ( $r_{(234)}=-0.22, p<0.001$ ), sexual abuse ( $r_{(234)}=-0.35, p<0.001$ ), physical abuse ( $r_{(234)}=-0.30, p<0.001$ ), neglect ( $r_{(234)}=-0.26, p<0.001$ ) and GSI ( $r_{(234)}=-0.47, p<0.001$ ). In addition, PD was found to be significantly associated with sexual abuse ( $r_{(234)}=-0.57, p<0.001$ ), physical abuse ( $r_{(234)}=-0.44, p<0.001$ ), neglect ( $r_{(234)}=-0.40, p<0.001$ ) and GSI ( $r_{(234)}=-0.73, p<0.001$ ).

### **Predictor analyses**

As expected, all forms of adversity increased the likelihood of a PD diagnosis. In three separate logistic regressions, controlling for marital status and age, sexual abuse, physical abuse and neglect significantly predicted the presence of PD diagnosis ( $\beta_{(1)}=3.36, SE=0.51, p<0.001, \beta_{(1)}=2.56, SE=0.45, p<0.001$  and  $\beta_{(1)}=2.37, SE=0.37, p<0.001$ , respectively). The likelihood of a subject who experienced sexual or physical abuse and neglect to develop a PD expressed in odds ratio were 28.70 (95% CI 10.51-78.35), 12.92 (95% CI 5.31-31.45) and 10.66 (95% CI 5.16-22.02), respectively. In order to ascertain if non-borderline PD diagnoses were also predicted by these early adversities, we performed the same logistic regressions, excluding BPD patients, and found non-borderline PD diagnoses to be significantly predicted by adversity ( $\beta_{(1)}=3.19, SE=0.61, p<0.001; \beta_{(1)}=2.32, SE=0.54, p<0.001$  and  $\beta_{(1)}=1.8, SE=0.47, p<0.001$ ).

We also found that adverse experiences predicted psychiatric distress. Three separate multiple linear regressions found that sexual abuse, physical abuse and neglect predicted higher scores in GSI ( $\beta=0.87, SE=0.10, t=8.38, p<0.0001; \beta=0.88, SE=0.11, t=7.93,$

$p < 0.001$  and  $\beta = 0.64$ ,  $SE = 0.11$ ,  $t = 6.13$ ,  $p < 0.001$ , respectively). Having experienced sexual abuse, physical abuse and neglect increased the GSI score by 0.87 (95% CI 0.67-1.08), 0.88 (95% CI 0.66-1.09) and 0.64 (95% CI 0.44-0.85), respectively.

Table 2 displays the GSI and RF means, standard deviations and t-values for participants divided according to demographic characteristics, aspects of childhood adversity and personality disorder diagnosis.

As expected, RF was a powerful predictor of PD diagnosis. A logistic regression with PD as the dependent variable found low RF to be a highly significant predictor of PD ( $\beta = -0.54$ ,  $SE_{(1)} = 0.10$ ,  $p < 0.001$  OR 1.72 95%CI 1.41-2.09). The mean RF score for the PD sample was significantly lower than that of the non-psychiatric sample. We repeated the logistic regression excluding BPD from the analysis and found that RF remained a significant predictor of non-borderline PD ( $\beta = -0.63$ ,  $SE_{(1)} = 0.16$ ,  $p < 0.001$ , OR 0.53 95%CI 0.39-0.72). RF was also predictive of self-reported severity of psychiatric symptoms (GSI). A linear regression, controlling for marital status, showed that low RF was a significant predictor of higher symptom distress in the sample ( $\beta = -0.21$ ,  $SE = 0.03$ ,  $t = -7.22$ ,  $p < 0.001$ , 95%CI 0.15- -0.27).

A further hypothesis of the study concerned the association between neglect, abuse and RF. Multiple linear regression with sexual abuse, physical abuse and neglect as predictors revealed that both variables were highly significant predictors of levels of RF ( $\beta = -1.10$ ,  $SE = 0.23$ ,  $t = -4.82$ ,  $p < 0.001$ ;  $\beta = -1.04$ ,  $SE = 0.24$ ,  $t = -4.30$ ,  $p < 0.001$ , and  $\beta = -0.89$ ,  $SE = 0.22$ ,  $t = -4.01$ ,  $p < 0.001$ , respectively). The presence of abuse and neglect predicted a reduction of 1.1 (95% CI 0.7-1.5), 1.0 (95% CI 0.6-1.5) and 0.9 (95% CI 0.5-1.3) in RF score, respectively.

We also examined whether having a history of both neglect and abuse (sexual and/or physical) increased the impact on levels of RF in an additive way (Fig 1). A one-way ANOVA showed that a combination of neglect and abuse resulted in a significant decrease in RF when neglect and abuse occurred in combination compared to no trauma or having experienced either neglect or abuse ( $F_{(1)} = 40.27, p < 0.01$ ). However, a two-way ANOVA found no indication of an interaction between neglect and abuse ( $F_{(1,228)} = 0.09, NS$ ), although both separately significantly decreased RF scores ( $F_{(1,228)} = 4.37, p < 0.04$  for neglect and  $F_{(1,228)} = 22.97, p < 0.001$  for abuse). In addition, we tested whether a dose-effect relationship existed between the number of childhood adversities experienced and the number of personality disorder diagnoses in later life. A linear regression showed that a higher number of experienced childhood traumas is a positive predictor of the number of personality disorder diagnoses ( $\beta = 1.44, SE = 0.13, t = 11.01, p < 0.001$ ).

Table 4 summarises the results of the various binary logistic and linear regression analyses as outlined above in the text.

### **Mediation analysis**

Subsequently, we carried out a mediation analysis with PD diagnoses as the dependent variable, adversity (a combination of either neglect or abuse, or both) as the independent variable, and RF as the potential mediating variable, controlling for marital status. The observed effect of adversity on PD diagnoses was highly significant ( $\beta = 2.15, SE = 0.21, t = 10.04, p < 0.001$ ). We tested the hypothesis that RF mediates the relationship between adversity and subsequent development of PD in later life (Fig 2). We found a significant relationship between the independent variable (adversity) and the mediator RF ( $\beta = -1.03, SE = 0.21, t = -5.01, p < 0.001$ ), and between the mediator (RF) and PD diagnoses ( $\beta = -0.19, SE = 0.07, t = -2.78, p < 0.01$ ). The effect of adversity on PD remained significant when the effect of the mediator (RF) was taken into account in the analysis ( $\beta = 1.95, SE = 0.22,$

$t=8.80, p<0.001$ ), which suggests that RF may be only one of the factors involved in mediating the effect of adversity on personality development. However, RF was confirmed as a significant mediator in the equation ( $\beta=0.19, 95\% \text{ CI } 0.07-0.39, SE=0.08, t=1.21, p<0.001$ ).

A second mediation analysis was carried out with GSI as the dependent variable and adversity as the independent variable, with RF as the mediator. A significant effect of adversity on reflective functioning ( $\beta=-1.03, SE=0.21, t=-4.99, p<0.001$ ) was found, while, in turn, the mediator (RF) had a significant association with severity of psychiatric distress (GSI) ( $\beta=-0.14, SE=0.03, t=-5.24, p<0.001$ ). The direct effect of adversity on symptom severity ( $\beta=0.86, SE=0.09, t=9.60, p<0.001$ ) was only slightly reduced when RF was introduced into the model ( $\beta=0.71, SE=0.09, t=7.99, p<0.001$ ). The indirect effect of adversity on GSI through RF as a mediator was nevertheless significant ( $\beta=0.15, 95\% \text{ CI } 0.08-0.23, SE=0.04, t=1.95, p<0.001$ ), indicating that RF is a significant mediator in the equation.

In the original conceptual model, we assumed that the effect of RF on PD would account for differences in symptom distress. The conceptual and statistical model for this analysis is shown in Figure 2. The model controls for marital status and assumes direct and indirect paths between adversity, RF scores and PD diagnoses.

As Figure 3 illustrates, there are a number of complex paths that connect these variables. The complete model is highly significant, accounting for over one quarter of the variance in the dependent variable ( $R=0.51, F_{(2, 229)}=40.02, p<0.001$ ). Adversity is directly connected to RF ( $\beta=-1.03, t=-5.0, p<0.001$ ) and PD diagnoses ( $\beta=1.95, t=8.80, p<0.001$ ) when marital status is controlled for. Several of the indirect paths between adversity and psychiatric distress were also significant. The path uniquely mediated by RF between adversity and GSI was significant using 1000 replicated bootstrapped samples for bias-



corrected estimates of standard errors ( $\beta=0.11$ , 95% CI 0.06-0.19,  $t=3.37$ ,  $p<0.001$ ). The path between adversity and GSI mediated by PD diagnoses was also significant ( $\beta=0.42$ , 95% CI 0.32-0.55,  $t=7.30$ ,  $p<0.001$ ). Importantly, the indirect path between adversity and psychiatric distress mediated by the association between RF scores and PD diagnoses was also significant ( $\beta=0.04$ , 95% CI 0.01-0.09,  $t=2.39$ ,  $p<0.001$ ).

## Discussion

Our study has once again found a strong relationship between the presence of adversity and PD diagnosis, which has been frequently demonstrated in past studies (Crawford et al., 2009; Sroufe, 2005; Zanarini, 2000). We also found the association between neglect and abuse is more specific to BPD compared to non-borderline personality disorders (Paris, 2003; Paris, 2004). In addition, we replicated the previously documented association between PD and low RF scores derived from the AAI (Fonagy, 2000; Fonagy, Target, & Gergely, 2000; Gunderson, 1996; Hill et al., 2011; Zittel & Westen, 1998). In addition, the present data shows that the strong relationship with low RF is present in non-borderline personality disorders. This intriguing finding regarding the generic nature of the RF deficit across PD diagnoses may confirm suggestions made by those drawing up the abortive DSM-V criteria for PD, that interpersonal comprehension and apprehension of others' experience, tolerance of different perspectives and the understanding of social causality is a key feature of all types of PDs. Similarly, the current Task Force empowered to draft the International Classification of version 11 are proposing to group together the various sub-types of PDs and divide them according to dimensional criteria of severity (Tyrer, Crawford, & Mulder, 2011). While we do not wish to enter this debate, the current findings are consistent with the theoretical model which suggests that the etiology of PD is rooted in a genetic vulnerability to trauma, which in turn affects interpersonal functioning via an impairment of reflective capacity. Particular sub-types of PDs (BPD and Avoidant)

reflect attachment styles that evolve to cope with the inevitable social challenges that ensue for these individuals.

We also examined the cumulative effect that different types of traumas in the same person have on RF and found that the relationship seems to be additive, with a combination of neglect and abuse lowering RF even more than if they occurred alone. However, we found no evidence of an interaction between early neglect and abuse. This finding suggests that early neglect does not sensitize the individual response to later trauma, by creating a vulnerability to the impact of later adversity by increasing the probability of RF deficit, and that neglect and abuse are independent of each other in the causation of personality problems and low RF. This is contrary to the hypothesis that early neglect specifically increases individual vulnerability to later adversity (Fonagy & Bateman, 2008). We might have expected that those who had suffered early neglect would show not only low RF, but also a stronger response to later adversity in terms of RF scores. It is possible that our measure of early neglect was inadequate; neglect is notoriously difficult to establish outside of observational studies. Our wish to use loss as an objective indicator of probable neglect was driven by the need to keep the measure of neglect independent of subjective experience as far as possible. The AAI also contains a rating for neglect, but to use this rating to predict another measure based on the same interview transcript would risk conflation of the findings. We have to conclude that we found no evidence from this retrospective study to support the hypothesis that early loss and relative neglect create vulnerability for later adversity associated with the impact of trauma on RF.

The mediation analysis confirmed our prediction that differences in RF accounted for the likelihood of PD diagnoses and psychiatric distress, and mediated the impact of childhood adversity. However, our findings indicated that differences in RF only partially explained

the presence of PD diagnoses and psychiatric distress, insofar that there is common variance between adversity and PD and between adversity and psychiatric distress, even after RF is controlled for. This would be explained by AAI-based RF being only a partial indicator of the underlying construct of mentalizing (Allen, 2012) or mentalizing being just one of a number of mediating mechanisms linking adversity to PD and psychiatric distress. While current evidence supports the notion that the capacity to conceive behaviour as underpinned by psychological states mediates the impact of early adversity on personality development (Carlson et al., 2009), other authors invoke a broader range of constructs, particularly affect regulation (Linehan, 1993) or the intensification of aggression and destructiveness (Kernberg & Caligor, 2005). We have neither additional measures of mentalizing (Luyten, Fonagy, Lowyck, & Vermote, 2012) nor adequate measures of other potential mediators. However, in recent models of the relationship between mentalizing and PD, a number of dimensions of mentalizing have been proposed in accounting for PD (Fonagy & Luyten, 2009). The deficit in PD is seen as mentalizing based on internal cues rather than external indicators, affective rather than cognitive, explicit rather than implicit. RF based on the AAI may be sensitive to some but not all of these deficits. A study of PD with a far broader range of measures is now required.

The overarching model which best fitted our data identified three separate routes by which adversity could be seen to generate symptomatic distress. PD diagnosis is clearly part of the picture, but adversity was linked to lower RF leading to greater distress independent of PD diagnosis. Once again, beyond RF and PD diagnoses, neglect and abuse predicted distress. We cannot be certain whether the complexity of this model is due to the limitations of the measures in capturing the underlying constructs or, as may be more likely, there are several independent pathways that link early adversity to symptomatic distress in later life.

This study has several advantages over previous reports. This is a relatively large-scale study using the gold standard measure of DRF, although more recently computerized coding systems for RF have become available (Fertuck, Mergenthaler, Target, Levy, & Clarkin, 2012). These interviews were independently coded by blind raters outside our clinical settings. Similarly, the diagnostic characterization of the samples is based on structured interviews with good inter-rater reliability. On the whole, we achieved a satisfactory, though not perfect, match between the clinical and non-clinical samples. The psychiatric sample was drawn from a range of clinical settings and is likely to be representative of severe PD presenting to clinical services.

On the other hand, the conclusion should be qualified by substantial limitations. There are limitations of our measures of neglect and trauma, and we have no historical data to corroborate patients' recall. The range of constructs examined did not address alternative accounts for both the neglect-trauma-PD and neglect-trauma-symptomatic distress significant pathways. As a consequence, variance remained unaccounted for after the predicted associations were incorporated into our statistical model.

A further limitation lies in the cross-sectional nature of the data. It would have been more desirable to assess the potential mediator variable in advance of the outcome variable for a more accurate evaluation of the pathways leading to PD and psychiatric distress.

Although we have shown that the model was applicable equally to borderline and to non-borderline PDs, the latter is a rather heterogeneous sub-group, which makes it difficult to draw robust conclusions regarding the significance of the association between this group and low reflective functioning.

Therefore, the study needs to be replicated with a broader range of measures, using a longitudinal design and a less heterogeneous PD sample.

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**Table 1** Socio-demographic and diagnostic characteristics of the total personality disorder (PD) sample, the borderline personality disorder sample, the non-borderline personality disorder sample and the non-psychiatric control sample

Variable	Total PD (n=112)		BPD (n=73)		Non-BPD (n=39)		Non-psychiatric (n=122)		Test of significance	
	mean	(SD)	mean	(SD)	mean	(SD)	mean	(SD)	<i>t</i> (PD v controls)	<i>t</i> (BPD v non-BPD)
Age	33.0	(8.1)	31.55	(6.96)	35.21	(9.23)	33.3	(5.3)	-0.40	2.35*
NART <sup>1</sup>	111.4	(15.4)	110.38	(17.60)	113.30	(9.96)	106.5	(15.4)	2.38*	0.93
SCL-90 GSI <sup>2</sup>	1.95	(0.71)	2.04	0.69	(1.78)	(0.72)	0.68	(0.44)	16.46***	-1.83
RF	3.47	(1.57)	3.42	(1.61)	3.50	(1.47)	5.11	(1.62)	-7.87***	0.24
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b><math>\chi^2</math> (PD v controls)</b>	<b><math>\chi^2</math> (BPD v non-BPD)</b>
Female gender	81	72.3	56	76.7	25	65.8	84	68.9	0.34	0.22
Single	65	58.0	46	63.0	19	50.0	30	24.6	27.09***	0.19
Race (white)	109	92.3	71	97.2	38	97.4	117	95.9	0.36	0.32
College education	46	41.1	28	38.4	17	44.7	62	50.8	2.23	0.52
Neglect	61	54.5	45	61.6	15	39.5	12	10.0	53.11***	4.95*
Sexual abuse	61	54.5	44	60.3	17	44.7	5	5.1	75.15***	2.44
Physical abuse	48	42.9	34	46.6	14	36.8	7	5.7	44.75***	0.97
Any adversity	91	81.3	64	87.7	26	68.4	22	18.3	91.79***	6.04*
PD	112	100.0	n/a	n/a	n/a	n/a	0	0	234.00***	n/a

\* $p < 0.05$ , \*\*\* $p < 0.001$

<sup>1</sup> National Adult Reading Test

<sup>2</sup> Symptom Checklist-90-R General Severity Index

**Table 2** Psychiatric distress (GSI) and reflective function (RF) mean scores for the total sample ( $N = 232$ ) divided according to demographic characteristics, trauma history and personality disorder (PD) diagnosis

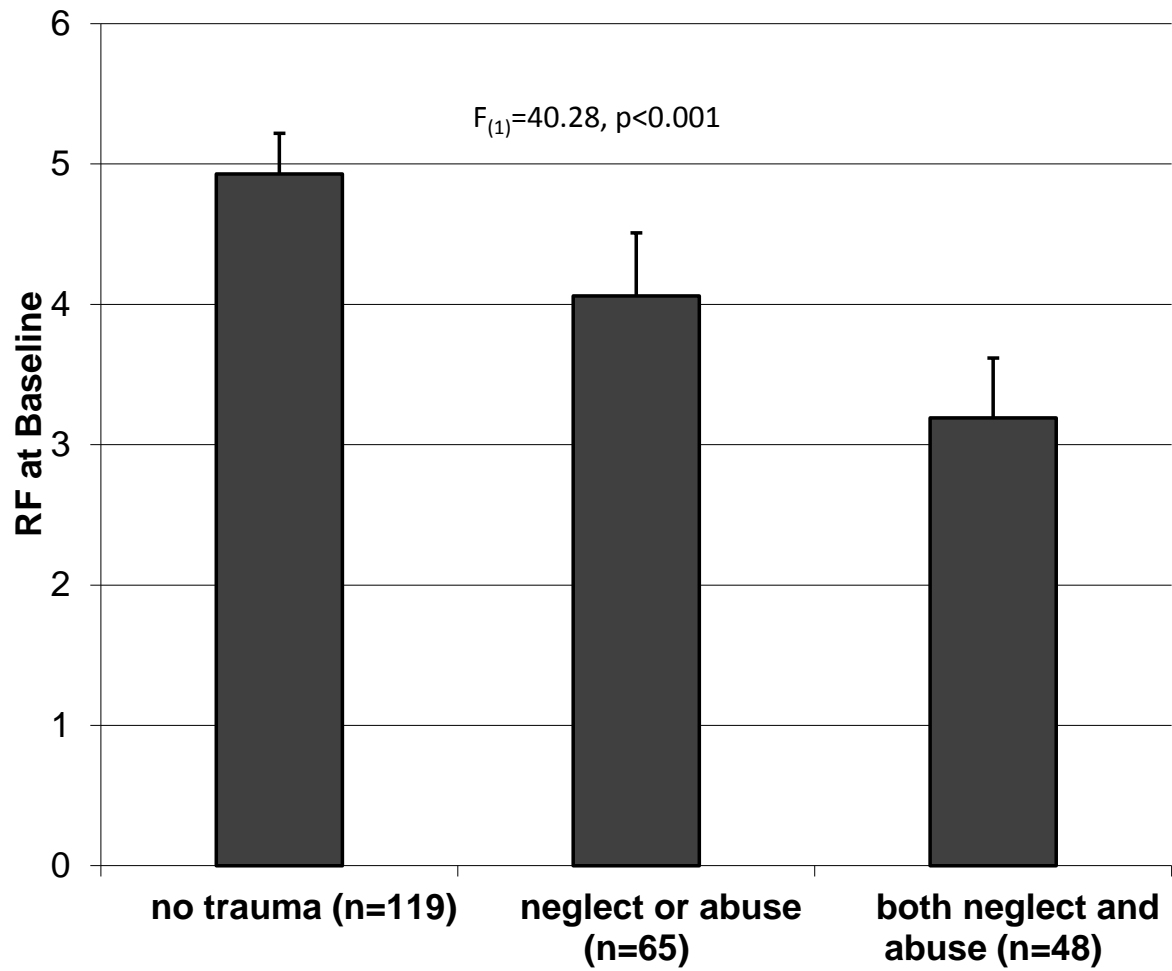
Variable	GSI		RF	
	Mean (SD)	<i>t</i>	Mean (SD)	<i>t</i>
Gender				
female	1.27 (0.90)	0.71	4.37 (1.86)	-0.54
male	1.32 (0.75)		4.29 (0.20)	
Education				
below college	1.37 (0.86)	1.52	4.19 (1.87)	0.38
college and above	1.20 (0.86)		4.49 (1.69)	
Neglect				
yes	1.77 (0.86)	6.27***	3.62 (1.84)	4.26***
no	1.07 (0.77)		4.66 (1.67)	
Sexual Abuse				
yes	1.99 (0.73)	-9.10***	3.32 (1.59)	5.75***
no	1.01 (0.75)		4.72 (1.71)	
Physical Abuse				
yes	2.02 (0.74)	-8.26***	3.35 (1.66)	4.83***
no	1.06 (0.76)		4.63 (1.72)	
Any adversity				
yes	1.77 (0.83)	9.95***	3.68 (1.75)	5.75***
no	0.83 (0.60)		4.94 (1.60)	
PD				
yes	1.95 (0.71)	-16.42***	3.45 (1.55)	8.05***
no	0.70 (0.45)		5.12 (1.62)	

\*\*\* $p < 0.001$

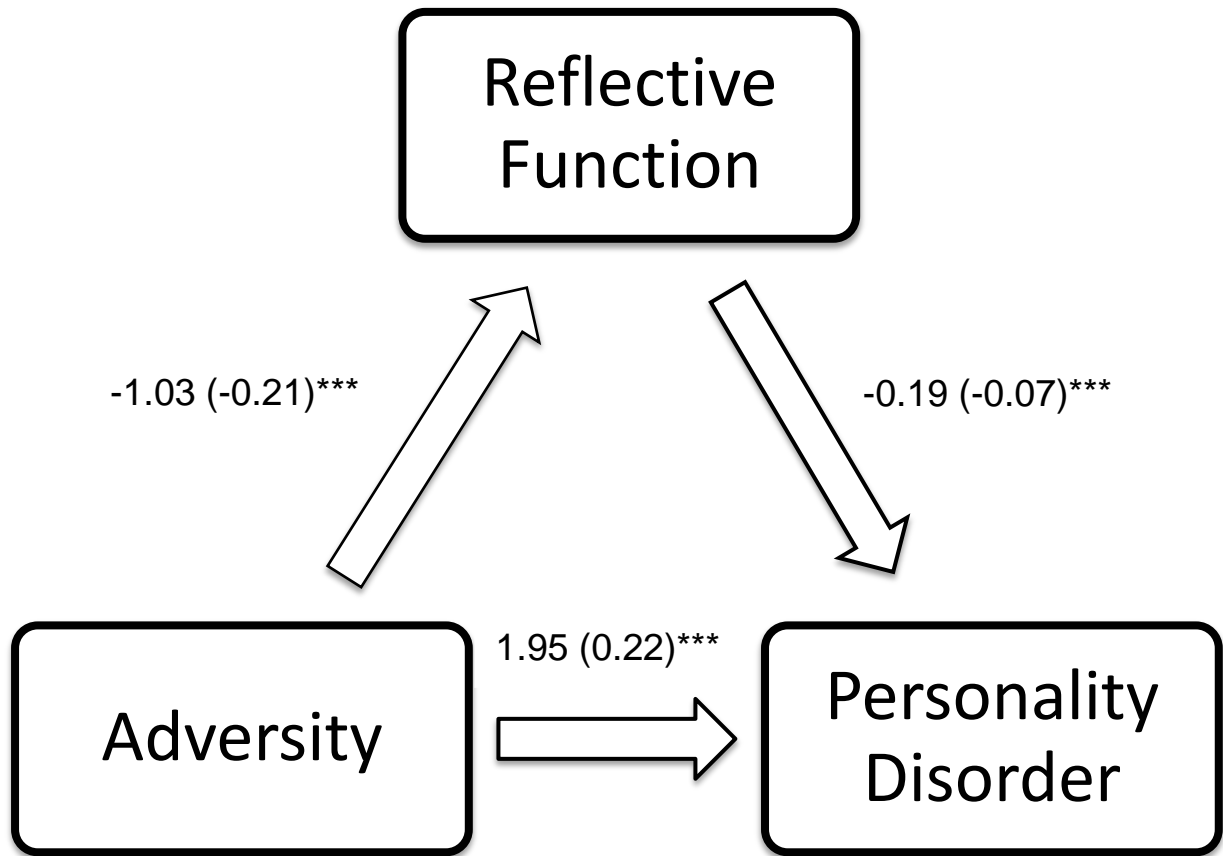
**Table 3** Summary of logistic and multiple linear regression analyses

	$\beta$ (SE)	Df	Sig.(p)	Odds ratio (95% CI)
<b>Sexual Abuse</b> (PD)	3.36 (0.51)	1	0.001	28.70 (10.51-78.35)
<b>Physical Abuse</b> (PD)	2.56 (0.45)	1	0.001	12.92 (5.31-31.45)
<b>Neglect</b> (PD)	2.37 (0.37)	1	0.001	10.66 (5.16-22.02)
<b>RF</b> (PD)	-0.54 (0.10)	1	0.001	1.72 (1.41-2.09)
	$\beta$ (SE)	t	Sig.(p)	95% CI for $\beta$
<b>Sexual Abuse</b> (GSI)	0.87 (0.10)	8.38	0.001	0.67-1.08
<b>Physical Abuse</b> (GSI)	0.88 (0.11)	7.93	0.001	0.66-1.09
<b>Neglect</b> (GSI)	0.64 (1.04)	6.15	0.001	0.44-0.85
<b>RF</b> (GSI)	-0.21 (0.03)	-7.22	0.001	0.15--0.27
<b>Sexual Abuse</b> (RF)	-1.10 (0.23)	-4.82	0.001	-1.54--0.65
<b>Physical Abuse</b> (RF)	-1.04 (0.24)	-4.30	0.001	-1.51—0.56
<b>Neglect</b> (RF)	-0.89 (0.22)	-4.01	0.001	-1.33--0.45

**Figure 1** Cumulative impact of early experiences of neglect and abuse on level of Reflective Function



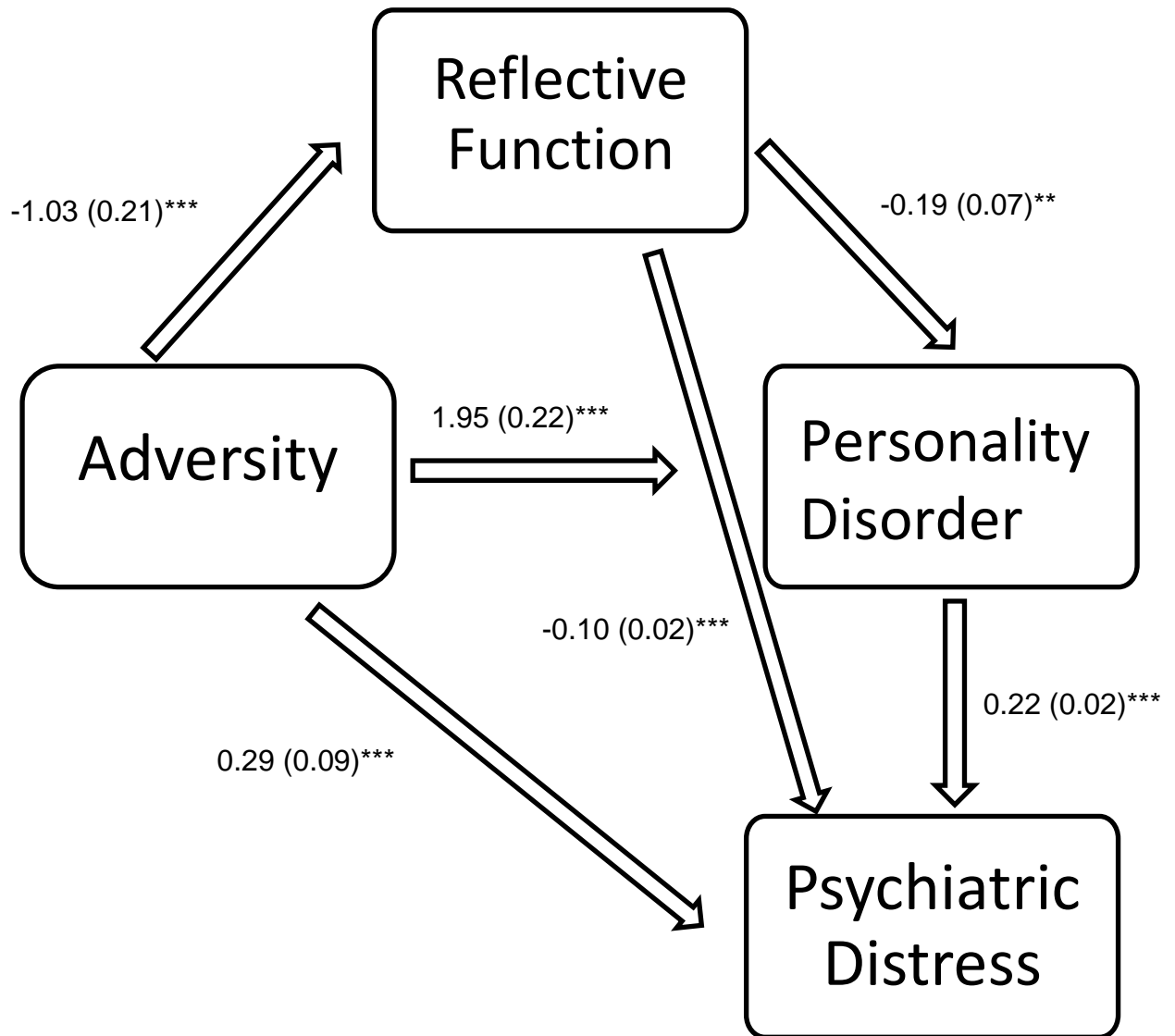
**Figure 2** Mediation analysis between adversity, personality disorder diagnoses and reflective function



\*\*\* $p < 0.001$



**Figure 3** Pathways connecting childhood adversity, reflective function, personality disorder and psychiatric distress



\*\*p<0.01 \*\*\*P<0.001