Categorical and dimensional approaches in the evaluation of the relationship between attachment and personality disorders: An empirical study

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Abstract

Although several studies have highlighted the relationship between attachment states of mind and personality disorders (PD), their findings have not been consistent, possibly due to the application of the traditional taxonomic classification model of attachment. A more recently developed dimensional classification of attachment representations, including more specific aspects of trauma-related representations, may have advantages. In this study we compare specific associations and predictive power of the categorical attachment and dimensional models applied to 230 Adult Attachment Interview transcripts obtained from personality disordered and non-psychiatric subjects. We also investigate the role that current levels of psychiatric distress may have in the prediction of PD. The results showed that both models predict the presence of PD, with the dimensional approach doing better in discriminating overall diagnosis of PD. However, both models are less helpful in discriminating specific PD diagnostic subtypes. Current psychiatric distress was found to be the most consistent predictor of PD capturing a large share of the variance and obscuring the role played by attachment variables. The results suggest that attachment parameters correlate with the presence of PD alone and has no specific associations with particular PD subtypes when current psychiatric distress is taken into account

Introduction

Attachment theory is a model that integrates early childhood experiences with later development, thus providing a useful framework to investigate the emergence of personality psychopathology in later life (Bakermans-Kranenburg & van IJzendoorn, 2009). Attachment theory explains not only the creation and persistence over time of attachment patterns but also "the many forms of emotional distress and personality disturbances, including anxiety, anger, depression, and emotional detachment" (Bowlby, 1978). In particular, attachment theorists have argued that behavioral as well as cognitive and representational strategies linked to each Internal Working Model are at the core of the development of specific domains relevant for personality pathology such as affective regulation, self-object representations, mentalizing capacity, interpersonal patterns of relating and sense of psychological autonomy and relatedness (Fonagy, Gergely, Jurist, & Target, 2002; Meyer & Pilkonis, 2006; Sroufe, Egeland, Carlson, & Collins, 2005). Therefore, psychological processes pertaining to each attachment pattern could be used to represent the relational, identity and affect regulation dysfunctions which are central features of some specific prototypes of personality pathology.

Empirical research using the AAI categorical model of scoring attachment patterns has yielded contrasting results in the exploration of the relationship between attachment patterns and personality disorders. Research using the Adult Attachment Interview (AAI) (George, Kaplan, & Main, 1985) has had a central role in clarifying how childhood relationships with primary caregivers become internalized and have a major influence on development and adult relationships (Steele, 2008; Van IJzendoorn, 1992). The AAI has been used to link Axis-II disorders based on the Diagnostic and Statistical Manual for Mental Disorder version IV (DSM-IV) (American Psychiatric Association, 1995) with current attachment status, particularly in relation to the association of borderline

personality disorder (BPD) and unresolved and preoccupied states of mind (Barone, 2003; Diamond et al., 2014; Groh, Roisman, van Ijzendoorn, Bakermans-Kranenburg, & Fearon, 2012; Lyons-Ruth, Yellin, Melnick, & Atwood, 2005), showing that unresolved states of mind in relation to abuse and loss is more common in those with a diagnosis of BPD (Barone, 2003; Barone, Fossati, & Guiducci, 2011; Dozier, Stowall-McColough, & Albus, 2008; Patrick, Hobson, Castle, Howard, & Maughan, 1994; Stalker & Davies, 1995; Steele, Steele, & Fonagy, 1996; Stovall-McClough & Cloitre, 2003). Some, but not all studies, show entangled ambivalent ('C' classification) attachment pattern to be more common in BPD (Bakermans-Kranenburg & van IJzendoorn, 2009; Barone, 2003).

Unresolved states of mind in relation to loss or abuse are considered indicators of disorganized attachment (Holmes, 2004; Lyons-Ruth et al., 2005). A review of 13 empirical studies supported the centrality of disturbed attachment for BPD: disorganized attachment was estimated at between 32% and 89%, which was raised to 100% among BPD patients with history of trauma (Agrawal, Gunderson, Holmes, & Lyons-Ruth, 2004; Frigerio, Costantino, Ceppi, & Barone, 2013). In a sample of adults and adolescents, Westen and colleagues (2006) examined the relationship between attachment and personality pathology and found significant correlations between BPD and disorganized attachment (0.44 for adolescents and 0.48 for adults). Among these studies, earlier ones showed stronger correlations between BPD and disorganization (around 0.8), while more recent studies have shown a somewhat weaker association (0.5-0.6). A number of studies have shown that preoccupied ('E' classification) attachment pattern are more common in BPD (Bakermans-Kranenburg & van IJzendoorn, 2009; Barone, 2003). However, more recent studies have highlighted that no single AAI classification has a specific association with a diagnosis of BPD, and have emphasized the likely presence of a complex pathway leading from AAI states of mind to the various aspects of BPD psychopathological features. For example, dismissing and cannot classify

classifications were found to be more significantly associated to BPD diagnosed in comorbidity with narcissistic PD (Diamond et al., 2014), while Morse and colleagues (2009) found that BPD patients exhibiting high levels of anger were significantly more likely to receive a cannot classify coding than BPD patients who were more fearful and prone to inhibit their anger, who in turn were more frequently classified as preoccupied.

Only a few studies have investigated PDs other than BPD but, when investigated, the findings have been mixed in relation to attachment classification. No specific association has been found between cluster A, cluster B and cluster C PD other than BPD, except for unresolved states of mind and schizotypal personality disorder (Bakermans-Kranenburg & van IJzendoorn, 2009; Riggs et al., 2007). The association between antisocial PD to dismissing, unresolved or cannot classify states of mind (Rosenstein & Horowitz, 1996), has been replicated in more recent studies that, however, focused on externalizing problems, without explicitly linking the findings to antisocial personality diagnosis (Kobak, Zajac, & Smith, 2009). The antisocial and violent behaviors directed toward others in forensic populations were found to be significantly associated with dismissing and unresolved states of mind, while abusive and violent behaviors perpetrated within the family contexts are significantly linked to preoccupied states of mind (Marin-Avellan, McGauley, Campbell, & Fonagy, 2005). Recent studies that explored the prediction of personality pathology from attachment-related dimensions, have found that Hostile-Helpless state of mind, which is a reflection of the degree of disorganization, dissociation and affective polarization of attachment representations related to early traumatic experiences, were significantly associated with Cluster B PD diagnoses (Finger, Byun, Melnick, & Lyons-Ruth, 2015; Frigerio et al., 2013; Lyons-Ruth, Melnick, Patrick, & Hobson, 2007). These studies

underscore the importance of the processes of representation of past relational traumatic experiences for understanding the role of attachment to the development of personality pathology.

A study showing significant associations between specific personality disorders and attachment dimensions as assessed through a self-report questionnaire (Riggs et al., 2007), highlights the advantages of a dimensional approach to the evaluation of attachment processes. However, there are shortcomings in using self-report measures, as their results may be biased by the subjects current states of mind and do not allow for checks on the consistency and validity of the self-descriptions provided with respect to attachment issues. Therefore, the association between attachment dimensions and personality pathology run the risk of being an artefact attributable to representational distortions derived from current personality pathology.
(Agrawal et al., 2004; Levy, 2005; Rosenstein & Horowitz, 1996; 1996)

The heterogeneity of attachment classification with PD diagnoses and the lack of replicability of associations between PDs and attachment classification across studies may be due to the inappropriateness of the classification system to clinical populations. Roisman and colleagues (2007) argue that 36% of reliable variance is lost when a continuous variable is treated categorically and the ability to detect true effects are compromised by the reduction of measurement precision. Roisman and colleagues identified a dimensional structure derived from a principal component analysis (PCA) applied to the variation of score distributions of the twelve scales of mind of the AAI (Roisman et al., 2007). The PCA yielded three orthogonal factors: defensive avoidance vs free/secure exploration of affective experiences (C1); active/angry preoccupation with past traumatic abusive experiences (C2); and passive/dissociative preoccupation with past traumatic loss experiences (C3). It has been argued (Roisman, Collins, Sroufe, & Egeland, 2005) that a dimensional approach may

have several advantages compared to the taxonomic model in normative samples: a) it increases statistical power (a dimensional model explains more variance than a taxonomic one); b) overcomes the interpretative biases of the taxonomic model, allowing a reading of the AAI as a profile of co-existing mental strategies, rather than a sharp alternative between categories; and c) captures the inherent dimensionality of the quality of affective experiences. In recent years, it has been suggested that there are benefits in the use of dimensional AAI scales, as they argue that this approach is less restrictive by the categorical classifications and increases statistical power (Hesse, 2016). In addition, it is possible that some of the unreliability found in the association between AAI classification and PDs is due to high levels of psychological distress, which is a regular feature in PD populations (Bateman & Fonagy, 2013; Chiesa, Sharp, & Fonagy, 2011; Giesen-Bloo et al., 2006). Current psychiatric mental distress may affect participants' recall and reconstruction of past attachments and representations, which in turn may have a degree of influence on the association between early attachment representations and development of later PD (Dozier et al., 2008).

The lack of robust associations between attachment and PD may also arise from the categorical classification of PDs, which could also be underpinned by continuously distributed underlying variables. The categorical model for PD reproduced in DSM-5 (American Psychiatric Association, 2013) is not empirically supported (Hopwood, Zimmermann, Pincus, & Krueger, 2015) and it is undermined by excessive comorbidity, excessive within-diagnosis heterogeneity, marked temporal instability, no clear boundary between normal and pathological personality pathology, and poor convergent and discriminant validity (Skodol, 2011; Wright & Zimmermann, 2015). PD is therefore increasingly seen as a dimensional disorder, with emphasis on personality functioning and pathological personality traits (Skodol, 2012; Tyrer, Crawford, & Mulder, 2011). Previous studies, which examined the usefulness of the AAI in predicting the presence of specific PDs, have not

examined the usefulness of either continuous or categorical measures of attachment in distinguishing between specific PDs in a clinical group using both categorical and dimensional approaches to PD diagnosis.

Based on these considerations, the current study aims to 1) evaluate specific associations between categorical states of mind with respect to Attachment and DSM-IV Axis-II PDs, and subsequently to verify whether a dimensional interpretation of the same AAIs is more reliable predictor of specific PDs than the taxonomic model; 2) examine whether the categorical and dimensional attachment classifications predicts PD categories within a group where PD diagnosis has been confirmed. Since PD is increasingly conceptualized as a dimensional rather than a categorical disorder, predictive analyses, with Main's categories and Roisman's components as predictor variables and overall number of positively scored traits on the SCID-II for overall PD, and for specific PD diagnosis in the PD sample as outcome variables, were also carried out; 3) In order to evaluate the role of current severity of psychiatric distress (GSI) on the prediction of PD by the attachment variables, we included GSI in all regression analyses as one of the independent variables.

A relatively large sample is necessary to verify the robustness and reliability of the dimensional approach to AAI rating in preference to the categorical model.

Study sample

A group of 230 subjects, aged 19-53 years, were recruited at two different clinical settings: 111 adults with a diagnosis of PD (PD sample) treated at the Cassel Hospital, London, UK and 119 non-psychiatric subjects (non-PD sample), matched for age and gender, treated for medical and surgical conditions at University College London Hospital. Participants were on average 33 years old (SD=

6.66), mostly female (n=161, 70%) and over half of them were married at some point in their lives (n=137, 59.6%). With regard to Axis-II profiles, 111 participants (48.3 %) met criteria for at least one PD. The most frequent PD diagnoses were borderline (n=65, 28.3%), avoidant (n=67, 29.1%), and paranoid (n=50, 21.7%).

All patients were approached by a research assistant and gave written informed consent to participate in the study, which entailed the administration of the AAI and the other intake measures. All measures were applied at intake into the study within three weeks of giving informed consent.

Ethical approval was sought and obtained from the Riverside Mental Health Trust committee for the clinical psychiatric sample and from the UCL Research Ethics committee for the non-PD control sample.

Measures

Childhood experiences of abuse and loss were collected at intake by an assistant psychologist and a psychiatrist using the *Cassel Baseline Questionnaire,* a structured interview with operationalized definitions and clearly defined anchor points (Chiesa & Fonagy, 2000). Early loss was defined as prolonged separation from a primary caregiver (normally the mother or father), including permanent loss of the caregiver through death, between the age 0-16. Sexual abuse was elicited from the subject's report of sexual interference by an adult before the age of 14 or forced sexual assault including post-puberty. Reports of bodily maltreatment by caregivers of sufficient intensity and severity to leave bruising or other significant marks defined presence of physical abuse. These definitions were modelled on the work of Bifulco and colleagues for the retrospective elicitation of childhood experiences of care and abuse (Bifulco, Brown, & Harris, 1994).

In order to control for possible confounding effects of differences in language fluency and skills on attachment narratives and ratings (Bakerman-Kranenburg & Van IJzendoorn, 1993), particularly

with regard to coherence of mind and coherence of transcript, we obtained intelligence quotient equivalents through the administration of the *National Adult Reading Test (NART)* (Nelson, 1982), which consists of a list of fifty words printed in order of increasing difficulty.

The Structured Clinical Interview for DSM-IV-II (*SCID-II*) (First, Gibbon, Spitzer, Williams, & Benjamin, 1997) was applied to each participant for identification of Axis-II Personality Disorders. *SCID-II* is based on the diagnostic criteria of the Diagnostic and Statistical Manual for mental disorders version IV (American Psychiatric Association, 1995). Senior psychiatrists and clinical psychologists independent from the treating clinical teams and trained to DSM-IV diagnostic criteria applied and rated the SCID-II diagnostic measure.

The Symptom Checklist-90-R (Derogatis, 1983), a four-point self-report clinical rating scale, was used to evaluate the subjective level of symptomatic distress. The SCL-90-R general severity index (GSI) was the total score used for this purpose.

The Adult Attachment Interview (George et al., 1985) is a semi-structured interview assessing the organization of adult's current state of mind with respect to attachment and the resolution of traumatic past experiences. Details of the participant's relationship with their primary caregivers, including emotional upsets as a child, possible experiences of separation and rejections from parental figures, the occurrence of anxieties and worries as a child, presence of experiences of abuse and of significant losses through death, and occurrence of other traumatic experiences are elicited. The impact of these early experiences on their adult personality and possible explanation for the caregivers' past behaviors are then explored with the participants. Because of its psychometric properties, the AAI is considered the best measure to rate adult attachment (Hesse, 2008). The AAI were audio-recorded, transcribed, and then sent to two coders who completed training with the original group who developed the AAI at the University of California (Mary Main and Eric Hesse), achieving reliability on an extensive set of AAI transcripts. The raters were independent from DSM-

IV diagnoses evaluators and blind to any other clinical information regarding the subjects. The transcripts were coded according to the four-category system, which includes Secure, Dismissive, Preoccupied and Cannot Classify. Transcripts were also coded as resolved or unresolved for abuse and loss generating three categories: Not Unresolved (NU), Unresolved for abuse (U-abuse) and Unresolved for loss (U-loss). For the purposes of this study, we used five separate categorical variables in the analysis of the data: Insecure, Preoccupied, Cannot Classify, Unresolved for abuse and Unresolved for loss.

As noted above in the introduction, Roisman and colleagues (2007) developed a dimensional approach to the rating of AAI by using a taxometric procedure, which entailed a principal component analysis with Varimax rotation on the AAI states of mind scales (Meehl, 1996). This procedure generated a three component structure. The first component (C1) contains AAI scales along the secure-dismissive continuum, with high loading for 'mother idealization', 'father idealization', 'coherence of mind', 'lack of memory' and 'metacognitive monitoring'. The second component (C2) reflects degrees of angry preoccupation with unresolved abusive experiences as indicated by the high ratings of AAI scales of 'father anger', 'mother anger', 'derogation' and 'unresolved abuse'. Finally, the third component (C3) reflects a passive and loss related preoccupation as indicated by the ratings of 'unresolved loss', 'fear of loss' and 'passivity' scales.

Statistical analysis

Chi-squared tests for categorical variables and independent samples t-tests for continuous variables were used to test differences between the PD and non-PD samples in demographics, childhood adversity, severity of psychiatric distress and Main taxonomic and Roisman's dimensional attachment status variables.

In order to test the first and second objective of the study, namely, the significant level of the association, and relative predictive power of the categorical and dimensional AAI variables on presence of PD diagnosis and specific PD diagnoses (Paranoid, Borderline and Avoidant), linear correlations were first carried out. Subsequently, separate hierarchical logistic regressions were performed with PD as overall diagnosis, and the specific PD diagnoses (paranoid, borderline and avoidant) as the dependent variables, the categorical and dimensional AAI classifications as predictor variables, and psychiatric distress and intelligent quotient equivalent as covariates. The comparison between the predictive value of categorical and dimensional evaluation of the AAI was evaluated by matching the increase in the percentage of variance explained by each regression model (Nagelkerke R^2) and the corresponding levels of statistical significance for such increase. Overall significance, model percentage of variance explained (B scores) by any single component within the regression model and Odd Ratios derived from each logistic regression are reported. The comparison between the predictive value of dimensional and categorical approaches was also extended to evaluation of PD as a dimensional variable, by performing separate multivariate linear regressions with dimensional scores (the number of positive PD traits scored in the SCID-II) for overall PD and specific PD diagnoses as dependent variables, Main's categorical and Roisman's dimensional AAI scores as predictor variables, and psychiatric distress and NART as covariates.

We also tested the degree of accuracy of both the AAI-derived categorical and dimensional models in identifying and predicting PD variables. The diagnostic efficiency statistics were calculated using a program modeled on Streiner (2003), applied to the classification tables obtained from each of the separate logistic regressions, to arrive at an evaluation of the sensitivity (the probability of correctly identifying positive diagnoses) and the specificity (the probability of false positives when the disorder is in fact not present) of the diagnostic efficiency based on the two models of rating

the AAIs. We also calculated odds ratios, (an overall measure of effectiveness of the two approaches in correctly identifying true positives and true negatives), positive likelihood ratios (true positive rates/false positive rates=sensitivity/1-specificity) and negative likelihood ratios (false negative rates/true negative rates=1-specificity/specificity).

In order to test the third objective of the study, namely, the impact of the degree of psychiatric symptoms severity on PD diagnoses, we examined the level of significance of GSI as independent variable, which was obtained in the regression models as described above. Model percentage of variance explained (B scores) by GSI within the regression models and the correspondent Odd Ratios allowed to compare the impact of the degree of psychiatric symptoms severity in the prediction of PD diagnoses relative to AAI categories and dimensions.

Results

Table 1 compares the PD and non-PD samples. They were well matched with regard to demographic, risk factors, clinical severity and attachment status variables, but there was a significant difference between the groups on Intelligence quotient equivalents as measured by the NART. As expected, they were significantly different in early adversity (sexual abuse, physical abuse and experiences of loss) and psychiatric severity variables. With regard to Main's categories of attachment, the PD sample showed significantly higher percentages of insecure, cannot classify, unresolved for abuse and unresolved for loss, compared to the non-psychiatric controls. Differences between the PD and non-PD groups were also significant when we compared the Roisman's three dimensions scores, with significantly higher means being found in the PD group.

Please, insert Table 1 here

Table 2 outlines the correlations between Main's categories, Roisman's dimensions of attachment and PD diagnoses. The figures represent phi coefficients where the association involves two dichotomy variables and point-biserial correlations when the comparison involves one continuous and one dichotomy variable. Main's attachment categories of insecure, cannot classify, unresolved for loss and unresolved for abuse were found to be significantly associated with all PD diagnostic variables considered. Preoccupied category was only significantly associated with paranoid PD. Roisman's C2 (angry dissociative preoccupation) and C3 (passive dissociative preoccupation) dimensions were also found to be significantly associated with all diagnostic variables. C1 (defensive avoidance) was significantly associated with PD, paranoid PD, and avoidant PD, but not borderline PD.

Please, insert Table 2 here

The separate hierarchical logistic regression analyses with attachment categories as predictor variables and PD diagnoses as dependent variables are displayed in table 3. The overall fit of the models was statistically significant for PD, paranoid PD and avoidant PD, but not for borderline PD. Interestingly, GSI was found to be the most significant predictor in each of the significant regression analyses. In addition, NART and preoccupied category were significant predictors of PD diagnosis and paranoid PD, respectively.

The regression analyses for Roisman's dimensional components showed that each model was statistically significant for the prediction of overall PD, paranoid PD and avoidant PD, but not borderline PD. GSI again was revealed to be the most significant predictor. However, NART and C3 (passive dissociative preoccupation) were also significant predictors of PD, and C1 dimension (defensive avoidance) was also a significant predictor of Paranoid PD.

Please, insert Table 3 here

The results of the linear regression analyses with PD and specific PD diagnoses as dimensional disorders showed that the overall fit of each model was statistically significant (table 4). With regard to the categorical model, none of Main's categories were significant predictors of the PD dimensional outcome variables, but GSI was again the only significant predictor. Looking at Roisman's dimensional model, both C2 (angry dissociative preoccupation) and C3 (passive dissociative preoccupation) dimensions were significant predictors of overall number of PD symptoms. Furthermore, C2 (angry dissociative preoccupation) was a significant predictor of overall number of borderline PD symptoms. GSI again was revealed to be the strongest predictor of all outcome variables (table 4).

Please, insert Table 4 here

Table 5 outlines and compares figures with regard to accuracy rates of the categorical and dimensional models in identifying true positive and true negative PD diagnoses. While, we found no substantial differences in Sensitivity between the two models for presence of overall PD and PD sub-categories. The categorical model was slightly more sensitive in identifying presence of paranoid PD, while the Roisman's three component solution was slightly more sensitive in predicting borderline PD. With regard to Specificity, the two models showed only minor differences in the accuracy in identifying the true negative rates for all diagnostic variables. The diagnostic odds ratio, which is a measure of the overall effectiveness of the two models in accurately predicting presence and absence of PD diagnoses, showed that Main's categorical model was more accurate in detecting

presence of paranoid PD and avoidant PD, while Roisman's model showed higher accuracy rates for overall PD and borderline PD. The Positive Likelihood Ratio (the ratio between the probability of a positive test result given the presence of the disorder and the probability of a positive test result given the absence of the disorder) revealed that the categorical approach was marginally superior to the dimensional model for paranoid PD and avoidant PD. The dimensional model did better for presence of overall PD and borderline PD. Finally, in the identification of the ratio between false negative and true negative rates (Negative likelihood Ratio) there were no differences with regard to overall PD. Differences favoring the dimensional models were found for borderline PD and marginally for Avoidant PD, while the categorical approach did slightly better for Paranoid PD.

Please, insert Table 5 here

Discussion

In this study we compared two systems of classification of attachment status in the discrimination of, and association with PD in general and PD subtypes in particular: the traditional Main taxonomic model and the more recently developed Roisman dimensional model. The results showed that within the categorical approach, overall psychiatric distress was the most consistently significant predictor of the presence of diagnosis of overall PD, and that attachment classification, independent of psychiatric distress, fails to predict categorical diagnosis of PD. There was a small association between the 'cannot classify/disorganized' category and the diagnosis of PD, but this association was weak and the confidence interval around the odds ratio was very large. By contrast, a more robust association was observed using Roisman dimensional model. The association with PD was specific to passive dissociative preoccupation with loss. Including the Roisman's scores in the model accounts for 8% of additional variance.

Most of the categorical and dimensional AAI variables were found not to have significant predictive power for specific sub-categories of PD, except for 'preoccupied' and 'defensive avoidance for abuse' for Paranoid PD. Beyond paranoid PD both models were disappointing in indicating any specific associations with sub-types of PDs.

These results may seem a surprising result given the extensive literature linking attachment status with PD. The most likely reason for this lack of association rests in the instability of the AXIS-II classification system. Several studies have shown substantial cross-loading between diagnostic criteria and various sub-types of PD leading to high level of correlation between PD diagnoses (Sharp et al., 2014; Skodol, 2011). Aligned with this consideration, there is considerable weight behind integrating the various subtypes of PD diagnoses (Tyrer et al., 2011). Perhaps, the general model of PD pathology currently in use is limited because it conflates overall personality dysfunction (the core of PD) with specific manifestations of particular sub-types. A system of classification that looks at subtypes only once the core pathology has been assessed and taken into account (Caspi et al., 2014; Fonagy, Campbell, & Bateman, 2016), may be more meaningfully related to attachment categories or dimensions. This would require a criterion level of analysis which we were unable to perform in this study. Arguably, a coding system for the AAI needs to be developed to assess level of personality functioning, in line with the alternative model for PD outlined in the DSM-5 Section III, which places four dimensional sub-components of identity and self-direction (both relating to the relationship to the self), and empathy and intimacy (both relating to interpersonal functioning), as core features of PD. As DSM-5 suggests, the essential feature of PD is a general underlying impairment in terms of self and interpersonal relating, characterized by negative affectivity, impulsivity, separation anxiety, sense of emptiness, dissociated states, detachment and antagonism. In our PD sample, we did find a general dysfunction of interpersonal representations of relationships that converge with DSM-5

conceptualization of PD., showing that the AAI can contribute to capture and assess these dimensions which are central to PD core psychopathology.

With regard to the prediction of PD as a dimensional entity, Roisman's angry dissociative preoccupation (C2) and passive dissociative preoccupation (C3) were more sensitive predictors of PD overall compared to the taxonomic model. This difference may be interpreted in terms of Roisman's combination of active and passive modes of dealing with traumatic memory of abuse or loss (C2 & C3 components), combining mental strategies that are kept apart in Main's taxonomic model. It may be that this integration better captures the nature of the link between attachment processes and personality pathology.

Unlike the majority of previous studies on attachment and PD, in this study we evaluated the possible role played by current level of psychiatric symptoms distress. In our results, psychiatric distress as measured by the GSI was found to be the most consistent predictor of PD obscuring the role played by attachment variables. There may be a number of reasons for this finding. Firstly, the way past attachments and representations are reconstructed by participants may be strongly influenced by current psychiatric mental distress, so to some degree, the association of attachment and PD is determined by the result of this confound. This may point to a vulnerability of the AAI, an instrument based on recall, which is influenced by current levels of mental distress and current mood-related biases (Roisman, Fortuna, & Holland, 2006). In other words, the lack of specificity found suggests that it may be a consequence of current psychiatric symptoms distress that leads to disruption in attachment representations as they are recalled in the AAI. Secondly, we know that attachment predicts psychiatric symptoms distress (Chiesa & Fonagy, 2014), as it represents a result of disrupted and dysfunctional attachment relationships (Dozier et al., 2008). Since PD reflects a

general vulnerability to psychiatric symptoms, we may conceive that psychiatric symptoms distress is an important mediator between attachment disruption and later onset of PD, and that there are strong theoretical arguments supporting the link between a trans-diagnostic indication of psychopathogy and the persistence of psychiatric disorder, as would be expected to occur in association with PD. Both psychiatric disorder and PD are fueled by active dysfunctional representations and correlated affect instability, which is derived from dysfunctional attachment (Steele & Siever, 2010). This finding dovetails with data from behavioral genetics (Kendler et al., 2008), which show a general structure of vulnerability in which each genetic or environmental factor may predispose the individual to develop any type of PD. However, we need to consider that the measures used to assess personality pathology (SCID-II) and psychiatric distress (SCL-90-R) may not be totally independent and that a degree of variance overlap may have occurred. It is conceivable that a subject with severe personality pathology may overestimate the subjective sense of symptoms distress, and vice versa.

Our results point to the taxonomic model as being particularly sensitive to evidence the general link between attachment experiences and representations, and increase the risk of PD. According to recent bi-factor models of the latent structure of PDs (Fowler et al., 2015; Sharp et al., 2014), symptoms of borderline PD appear to be higher order generic indicators of personality pathology. Further symptom level modelling of this data set, using bi-factor analytic models could confirm or disconfirm this speculation. Construed in this way, and moving from a cross-sectional to a hypothetical developmental psychopathology frame, we could look at presence of PD not as an additional diagnosis but an indicator of an absence of resilience, which predisposes individuals to develop a variety of psychiatric problems, because the relative absence of a capacity to withstand adversity consistent with this line of thinking is our finding that dissociative preoccupation with

trauma was the best indicator of personality difficulties, once current levels of psychiatric distress was controlled for.

A number of limitations ought to be taken into consideration when interpreting the results of this study. First, the cross-sectional nature of the design without any direct manipulation of variables, does not allow to arrive at solid conclusions regarding the power of the attachment classification systems to predict onset of PD in later life. Hence, longitudinal studies are needed to make claims about causality and temporal onset of PD and to investigate whether attachment categories and/or dimensions have predictive effects on PD diagnoses. Second, in addition to psychiatric distress, it would have been desirable to include predictor variables more specific and relevant to personality disorder psychopathology such as impulsive and self-harming behaviors. Finally, although the two raters were highly reliable and had extensive experienced in rating AAI transcripts, we were unable to carry out inter-rater reliability on AAI coding.

In summary, we found that the dimensional approach does better in discriminating overall PD compared to the categorical model, with most of the discriminant power accounted for by the C3 dimension. However, taking into account of lack of predictive significance for the PD specific diagnoses and the minor differences found in the comparison of diagnostic specificity and sensitivity scores, we may conclude that, on the basis of our results, there are only marginal differences between the two models.

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Table 1 Socio-demographic, risk factors and severity characteristics of the personality disorder (PD) and non-PD samples

	PD	Non-PD	Test of significance
Age mean (sd)	32.97 (8.15)	33.01 (4.92)	$t_{(178)}$= -0.04, p=0.968
Gender N (%)			
Female	80 (72.1%)	81 (68.1%)	$\chi^2_{(1)}$= 0 .44, p=0.508
Male	31 (27.9%)	38 (31.9%)	
Marital status N (%)			
Single	64 (57.7%)	29 (24.4%)	$\chi^2_{(1)}$= 26.42, p=0.000
Ever married	47 (42.3%)	90 (75.6%)	
NART mean (sd)	112.44 (10.60)	107.41 (14.56)	$t_{(216)}$= 3.01, p=0.003
GSI mean (sd)	1.94 (0.71)	0.68 (0.44)	$t_{(181)}$=-16.03, p=0.000
Loss N (%)			
Yes	61 (55.0%)	13 (10.9%)	$\chi^2_{(1)}$= 51.02, p=0.000
No	50 (45.0%)	106 (89.1%)	
Sexual abuse N (%)			
Yes	60 (54.1%)	5 (4.2%)	$\chi^2_{(1)}$= 70.40, p=0.000
No	51 (45.9%)	114 (95.8%)	
Physical abuse N (%)			
Yes	47 (42.3%)	7 (5.9%)	$\chi^2_{(1)}$ = 42.49, p=0.000
No	64 (57.7%)	112 (94.1%)	
AAI Main categories N (%)			
Insecure	99 (89.2%)	49 (41.2%)	$\chi^2_{(1)}$= 57.71, p=0.000
Secure	12 (10.8%)	70 (58.8%)	
Preoccupied	15 (13.5%)	16 (13.4%)	$\chi^2_{(1)}$=0.000, p=0.988
Non-preoccupied	96 (86.5)	103 (86.6)	
Cannot Classify	63 (56.8%)	9 (7.6%)	$\chi^2_{(1)}$= 64.63, p=0.000
Can Classify	48 (43.2%)	110 (92.4%)	
Unresolved for abuse	40 (36.0%)	7 (5.9%)	$\chi^2_{(1)}$= 32.12, p=0.000
Resolved for abuse	71 (64.0%)	112 (94.1%)	
Unresolved for loss	33 (29.7%)	2 (1.7%)	$\chi^2_{(1)}$= 35.02, p=0.000
Resolved for loss	78 (70.3%)	117 (98.3%)	
Roisman three component mean (sd)			
C1 - Defensive avoidance	3.71 (5.16)	2.11 (4.22)	$t_{(213)}$= 2.56, p=0.011
C2 - Angry dissociative preoccupation	10.57 (5.71)	7.30 (3.61)	$t_{(184)}$= 5.14, p=0.000
C3-Passive dissociative preoccupation	8.50 (3.72)	4.53 (1.68)	$t_{(151)}$= 10.29, p=0.000

Table 2 Correlations between personality disorder (PD) diagnoses, Main attachment categories and Roisman's dimensional components (N=230)

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1 PD												
2 Paranoid PD	0.55 p=0.000											
3 Borderline PD	0.65 p=0.000	0.51 p=0.000										
4 Avoidant PD	0.66 p=0.000	0.45 p=0.000	0.41 p=0.000									
5 Insecure	0.50 p=0.000	0.33 p=0.000	0.35 p=0.000	0.36 p=0.000								
6 Preoccupied	0.00 p=0.988	-0.15 p=0.027	0.01 p=0.919	-0.11 p=0.087	0.29 p=0.000							
7 Cannot Classify	0.53 p=0.000	0.42 p=0.000	0.41 p=0.000	0.48 p=0.000	0.50 p=0.000	-0.27 p=0.000						
8 Unresolved abuse	0.37 p=0.000	0.33 p=0.000	0.35 p=0.000	0.34 p=0.000	0.37 p=0.000	-0.11 p=0.111	0.68 p=0.000					
9 Unresolved loss	0.39 p=0.000	0.25 p=0.000	0.22 p=0.000	0.39 p=0.000	0.32 p=0.000	-0.13 p=0.046	0.60 p=0.000	0.14 p=0.027				
10 C1 Defensive avoidance	0.17 p=0.010	0.20 p=0.003	0.04 p=0.531	0.13 p=0.044	0.50 p=0.000	-0.09 p=0.184	0.18 p=0.008	0.08 p=0.210	0.01 p=0.934			
11 C2 Angry dissociative preoccupation	0.33 p=0.000	0.29 p=0.000	0.31 p=0.000	0.25 p=0.000	0.40 p=0.000	0.07 p=0.265	0.54 p=0.000	0.67 p=0.000	0.22 p=0.001	0.04 p=0.553		
12 C3 Passive dissociative preoccupation	0.57 p=0.000	0.37 p=0.000	0.42 p=0.000	0.41 p=0.000	0.50 p=0.000	0.08 p=0.239	0.64 p=0.000	0.28 p=0.000	0.77 p=0.000	0.10 p=0.122	0.41 p=.000	

Table 3 Prediction of personality disorder (PD) and specific PD diagnoses by Main's categorical model and Roisman's dimensional model through hierarchical logistic regression analyses with forced entry, controlling for psychiatric distress (GSI) and intelligence quotient equivalent (NART)

Outcome variables Main's categories	**B (SE)**	**Sig.(p)**	**Odds ratio [95% CI]**	**Outcome variables** Roisman's 3 component solution	**B (SE)**	**Sig. (p)**	**Odds ratio [95% CI]**
PD				**PD**			
GSI	3.44 (0.53)	0.000	31.10 [10.94, 88.42]	GSI	3.56 (0.57)	0.000	35.09 [11.46, 107.45]
NART	0.67 (0.02)	0.001	1.07 [1.03, 1.11]	NART	0.07 (0.02)	0.000	1.08 [1.03, 1.12]
Insecure	0.74 (0.67)	0.268	2.11 [0.56, 7.86]	C1 Defensive avoidance	0.06 (0.06)	0.263	1.06 [0.96, 1.19]
Preoccupied	0.21 (0.66)	0.747	1.24 [0.34, 4.54]	C2 Angry dissociative preoccupation	0.06 (0.06)	0.310	1.06 [0.95, 1.19]
Cannot Classify	2.28 (1.09)	0.037	9.78 [1.15, 83.02]	C3 Passive dissociative preoccupation	0.42 (0.10)	0.000	1.52 [1.25, 1.84]
Unresolved abuse	-0.58 (0.99)	0.557	0.56 [0.08, 3.91]				
Unresolved loss	0.91 (1.09)	0.408	2.48 [0.29, 21.37]				
Nagelkerke R^2=0.777; $\chi^2_{(7)}$=200.97, p=0.000 n=230				Nagelkerke R^2=0.792; $\chi^2_{(5)}$=207.27, p=0.000 n=230			
Paranoid PD				**Paranoid PD**			
GSI	0.73 (0.32)	0.021	2.07 [1.12, 3.83]	GSI	0.73 (0.30)	0.017	2.07 [1.14, 3.76]
NART	0.03 (0.02)	0.206	1.03 [0.99, 1.07]	NART	0.03 (0.02)	0.186	1.03 [0.99, 1.07]
Insecure	1.44 (0.84)	0.084	4.24 [0.83, 21.78]	C1 Defensive avoidance	0.09 (0.04)	0.037	1.09 [1.01, 1.19]
Preoccupied	-2.12 (0.92)	0.021	0.12 [0.02, 0.73]	C2 Angry dissociative preoccupation	0.07 (0.04)	0.070	1.07 [0.99, 1.16]
Cannot Classify	-0.22 (0.77)	0.780	0.81 [0.18, 3.63]	C3 Passive dissociative preoccupation	0.02 (0.06)	0.679	1.03 [0.91, 1.15]
Unresolved abuse	0.50 (0.58)	0.383	1.66 [0.53, 5.14]				
Unresolved loss	-0.19 (0.60)	0.757	0.83 [0.26, 2.69]				
Nagelkerke R^2=0.220; $\chi^2_{(7)}$=19.90, p=0.006 n=111				Nagelkerke R^2=0.168; $\chi^2_{(5)}$=14.86, p=0.011 n=111			
Borderline PD				**Borderline PD**			
GSI	0.45 (0.30)	0.131	1.57 [0.88, 2.81]	GSI	0.41 (0.29)	0.157	1.57 [0.85, 2.66]
NART	0.22 (0.02)	0.273	1.02 [0.98, 1.06]	NART	0.02 (0.02)	0.222	1.02 [0.99, 1.06]

Insecure	0.06 (0.75)	0.941	1.06 [0.25, 4.57]	C1 Defensive avoidance	-0.04 (0.04)	0.328	0.96 [0.89, 1.04]
Preoccupied	0.53 (0.71)	0.457	1.70 [0.42, 6.85]	C2 Angry dissociative preoccupation	0.05 (0.04)	0.163	1.06 [0.97, 1.14]
Cannot Classify	0.74 (0.75)	0.327	2.09 [0.48, 9.16]	C3 Passive dissociative preoccupation	0.02 (0.06)	0.774	1.02 [0.91, 1.14]
Unresolved abuse	0.36 (0.56)	0.516	1.44 [0.48, 4.36]				
Unresolved loss	-0.64 (0.59)	0.279	0.53 [0.17, 1.68]				
Nagelkerke R^2=0.094; $\chi^2_{(7)}$=8.03, p=0.330 n=111				Nagelkerke R^2=0.088; $\chi^2_{(5)}$=7.51, p=0.185 n=111			
Avoidant PD				**Avoidant PD**			
GSI	1.20 (0.34)	0.000	3.32 [1.70, 6.47]	GSI	1.20 (0.33)	0.000	3.32[1.75, 6.30]
NART	-0.01 (0.02)	0.748	0.99 [0.95, 1.04]	NART	-0.01 (0.02)	0.724	0.99 [0.95, 1.04]
Insecure	0.26 (0.78)	0.738	1.30 [0.28, 6.05]	C1 Defensive avoidance	0.02 (0.04)	0.659	1.02 [0.94, 1.11]
Preoccupied	-1.12 (0.78)	0.153	0.33 [0.07, 1.52]	C2 Angry dissociative preoccupation	0.01(0.04)	0.764	1.01 [0.94, 1.10]
Cannot Classify	0.09 (0.83)	0.912	1.10 [0.22, 5.55]	C3 Passive dissociative preoccupation	0.02 (0.06)	0.780	1.02 [0.90, 1.15]
Unresolved abuse	0.36 (0.66)	0.581	1.44 [0.40, 5.23]				
Unresolved loss	0.74 (0.68)	0.277	2.10 [0.55, 8.00]				
Nagelkerke R^2=0.281; $\chi^2_{(7)}$=25.81, p=0.001 n=111				Nagelkerke R^2=0.199; $\chi^2_{(5)}$=17.66, p=0.003 n=111			

Table 4 Prediction of number of PD symptoms by Main's categorical and Roisman's dimensional models in the PD sample through multiple linear regression analyses with forced entry controlling for psychiatric distress (GSI) and intelligence quotient equivalent (NART)

Main's categories	**B**	**95%CI**	**SE B**	**β**	**P**	**Roisman's components**	**B**	**95%CI**	**SE B**	**β**	**P**
DV: PD dimensional						**DV: PD dimensional**					
GSI	6.01	3.09, 8.93	1.47	0.37	0.000	GSI	6.23	3.41, 9.05	1.42	0.38	0.000
NART	0.12	-0.08, 0.32	0.10	0.13	0.221	NART	0.13	-0.5, 0.32	0.96	0.12	0.172
Insecure	1.33	-6.45, 9.12	3.93	0.04	0.735	C1 Defensive avoidance	-0.08	-0.46, 0.31	0.20	-0.03	0.702
Preoccupied	-3.42	-10.72, 3.87	3.68	-0.10	0.354	C2 Angry dissociative preoccupation	0.43	0.63, 0.31	0.19	0.21	0.022
Cannot Classify	-0.77	-8.34, 6.80	3.82	-0.03	0.840	C3 Passive dissociative preoccupation	-0.75	-1.31, -0.19	0.29	-0.24	0.010
Unresolved abuse	4.83	-0.79, 10.46	2.84	0.20	0.092						
Unresolved loss	-2.67	-8.47, 3.12	2.92	-0.11	0.362						
R^2= 0.210, $F_{(7,103)}$=3.91, p=0.001						R^2= 0.222, $F_{(5,105)}$=6.00, p=0.000					
DV: Paranoid PD dimensional						**DV: Paranoid PD dimensional**					
GSI	0.96	0.47, 1.45	0.25	0.35	0.000	GSI	0.97	0.49, 1.45	0.24	0.36	0.000
NART	0.05	-0.03, 0.04	0.02	0.02	0.821	NART	0.00	-0.03, 0.04	0.02	0.02	0.811
Insecure	0.91	-0.40, 2.21	0.66	0.15	0.170	C1 Defensive avoidance	0.06	-0.00, 0.13	0.03	0.17	0.065
Preoccupied	-0.94	-2.16, 0.29	0.62	-0.17	0.131	C2 Angry dissociative preoccupation	0.05	-0.02, 0.11	0.03	0.13	0.166
Cannot Classify	0.07	-1.20, 1.34	0.64	0.02	0.917	C3 Passive dissociative preoccupation	0.03	0.06, 0.13	0.05	0.06	0.505
Unresolved abuse	0.23	-0.71, 1.18	0.48	0.06	0.623						
Unresolved loss	-0.06	-1.03, 0.92	0.49	-0.01	0.909						
R^2= 0.193, $F_{(7,103)}$=3.53, p=0.002						R^2= 0.182, $F_{(5,105)}$=4.69, p=0.001					
DV: Borderline PD dimensional						**DV: Borderline PD dimensional**					
GSI	0.58	0.10, 1.06	0.24	0.22	0.018	GSI	0.61	0.13, 1.09	0.24	0.23	0.013
NART	-0.01	-0.04, 0.02	0.16	-0.05	0.618	NART	-0.00	-0.04, 0.03	0.02	-0.02	0.825
Insecure	-0.28	-1.56, 0.99	0.65	-0.05	0.663	C1 Defensive avoidance	-0.02	-0.09, 0.04	0.03	-0.06	0.514

Preoccupied	0.06	-1.14, 1.26	0.61	0.01	0.926	C2 Angry dissociative preoccupation	0.08	0.02, 0.14	0.03	0.24	0.014
Cannot Classify	0.79	-0.46, 2.04	0.63	0.21	0.211	C3 Passive dissociative preoccupation	0.00	-0.09, 0.10	0.05	0.00	0.977
Unresolved abuse	0.79	-0.13, 1.72	0.47	0.21	0.092						
Unresolved loss	-0.33	-1.29, 0.62	0.48	-0.08	0.492						
R^2= 0.175, $F_{(7,103)}$=3.13, p=0.005						R^2= 0.133, $F_{(5,105)}$=3.22, p=0.010					
DV: Avoidant PD dimensional						**DV: Avoidant PD dimensional**					
GSI	0.95	0.37, 1.53	0.29	0.30	0.002	GSI	1.06	0.47, 1.65	0.30	0.33	0.001
NART	-0.00	-0.04, 0.04	0.02	-0.01	0.887	NART	-0.00	-0.04, 0.04	0.02	-0.02	0.872
Insecure	0.03	-1.54, 1.60	0.79	0.00	0.968	C1 Defensive avoidance	0.04	-0.05, 0.12	0.04	0.08	0.398
Preoccupied	-1.05	-2.52, 0.42	0.74	-0.16	0.158	C2 Angry dissociative preoccupation	0.02	-0.06, 0.09	0.04	0.04	0.694
Cannot Classify	0.03	-1.47, 1.52	0.75	0.01	0.973	C3 Passive dissociative preoccupation	0.04	-0.07, 0.16	0.06	0.07	0.471
Unresolved abuse	0.66	-0.45, 1.77	0.56	0.14	0.239						
Unresolved loss	0.80	-0.35, 1.94	0.58	0.16	0.172						
R^2= 0.205, $F_{(7,100)}$=3.67, p=0.001						R^2= 0.130, $F_{(5,102)}$=3.05, p=0.013					

Table 5 Comparison of diagnostic specificity and sensitivity scores for Main categorical and Roisman dimensional models according to personality disorder categories

	Sensitivity	Specificity	Odds Ratio	Likelihood Ratio+ (LR+)	Likelihood Ratio- (LR-)
PD					
Main's AAI categories	0.88	0.91	74.01	9.55	0.13
Three-component solution	0.88	0.92	92.14	11.67	0.13
Paranoid PD					
Main's AAI categories	0.62	0.71	3.90	2.10	0.54
Three-component solution	0.52	0.74	3.05	1.98	0.65
Borderline PD					
Main's AAI categories	0.75	0.35	1.63	1.16	0.71
Three-component solution	0.81	0.37	2.59	1.29	0.50
Avoidant PD					
Main's AAI categories	0.88	0.57	9.70	2.04	0.21
Three-component solution	0.85	0.55	6.84	1.87	0.27

***Sensitivity*:** probability that a test result will be positive when the disorder is present (true positive rate)
***Specificity*:** probability that a test result will be negative when the disorder is not present (true negative rate)
Diagnostic odds ratio is a measure of the effectiveness of a diagnostic test
***Positive likelihood ratio*:** ratio between the probability of a positive test result given the *presence* of the disorder and the probability of a positive test result given the *absence* of the disorder, i.e. = True positive rate / False positive rate = Sensitivity / (1-Specificity)
***Negative likelihood ratio*:** ratio between the probability of a negative test result given the *presence* of the disorder and the probability of a negative test result given the *absence* of the disorder, i.e. = False negative rate / True negative rate = (1-Sensitivity) / Specificity