

From neuroticism to anxiety: Examining unique contributions of three transdiagnostic vulnerability factors



Daniel J. Paulus^a, Salome Vanwoerden^a, Peter J. Norton^b, Carla Sharp^{a,*}

^a University of Houston, Department of Psychology, Houston, TX, USA

^b Monash University, School of Psychological Sciences, Clayton, VIC, Australia

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ABSTRACT

Neuroticism has been implicated in many forms of psychopathology. Additional transdiagnostic factors such as shame, psychological inflexibility, and emotion dysregulation may explain the association between neuroticism and anxiety. While past work has, to some degree, evaluated these factors that cut across diagnostic categories, no study has evaluated them jointly to examine unique explanatory value over and above shared variance and/or general distress. The indirect effects of neuroticism via three transdiagnostic factors (shame, psychological inflexibility, and emotion dysregulation) on anxiety symptoms were evaluated among 97 inpatient adolescents (63.9% female; Mage 15.23; SD = 1.43) using three separate measures of anxiety (two self-report and one diagnostic symptom count) as well as a composite anxiety severity outcome variable comprised of all three measures. As expected, neuroticism was significantly associated with anxiety symptoms and all three transdiagnostic factors. Neuroticism via shame was the only significant indirect effect and was present in all models. The indirect effects were of medium size. Competing models testing alternative pathways were rejected, adding confidence to the significant findings of neuroticism via shame. Data were cross-sectional. For adolescent anxiety, shame may be particularly important. Future intervention work can examine effects of targeting shame among adolescents with high neuroticism and/or anxiety.

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1. Introduction

Among adolescents, anxiety disorders are the most common psychological problems (Kessler et al., 2012). Adolescent anxiety persists, predicting later symptomatology in adulthood (Olin, Klein, Lewinsohn, Rohde, & Seeley, 2010). One underlying factor that is strongly associated with anxiety is neuroticism (for review, see; Kotov, Gamez, Schmidt, & Watson, 2010), a personality factor that corresponds to and predisposes individuals to experience negative affect (Watson, Clark, & Tellegen, 1988). Neuroticism has been reliably studied among youth (Hink et al., 2013), with studies demonstrating continuity between youth and adult neuroticism (Caspi & Roberts, 2001). Neuroticism, though, is a broad factor implicated in the etiology of many other forms of psychopathology (e.g., Widiger, Verheul, & van den Brink, 2009). Thus, additional, more specific, risk factors should be identified and examined. The notion of considering both general and specific risk factors is in line with Barlow's (2004) triple vulnerability model, which states that the development of anxiety results from general genetic, general psychological, and disorder-specific (or semi-specific e.g., Taylor, 1998) factors.

Shame has been described as a risk factor for the development of psychological symptoms such as anxiety (e.g., Lewis, 1971), though, until recently, empirical studies have been limited due to lack of reliable measures of shame (Rizvi, 2010). Shame has been labeled as a self-conscious emotion that emerges when flaws of the self are revealed to others (Dearing, Stuewig, & Tangney, 2005). It is associated with a range of emotional disorders (Tantam, 1998), correlating significantly with neuroticism (Woien, Heidi, Patock-Peckham, & Nagoshi, 2003) and anxiety (Fergus, Valentiner, McGrath, & Jencius, 2010) in adults. However, there is a dearth of research examining such associations among adolescents. Developmentally, this is a crucial period of study as it has been suggested that, although shame is present earlier in childhood, levels of shame may increase during adolescence (Reimer, 1996) and take on maladaptive forms (Szentágotai-Tátar et al., 2015). To date, no study has evaluated shame as a potential explanatory factor underlying the association of neuroticism and anxiety among any age group.

In addition to shame, psychological flexibility is another relevant factor to consider with regard to neuroticism and anxiety. It is a broad term conceptualized as an "ability to contact the present moment" and "to change or persist in behavior when doing so serves valued ends" (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Deficits in exhibiting psychological flexibility (psychological inflexibility) has been associated with higher rates of anxiety in adults and children, and is considered a risk factor for the development of a range of mental health issues

* Corresponding author at: The University of Houston, Department of Psychology, 126 Heyne Building, Suite 104, Houston, TX 77204, USA.
E-mail address: csharp2@central.uh.edu (C. Sharp).

(Fergus et al., 2012). Psychological inflexibility is associated with neuroticism (Latzman & Masuda, 2013), and is a significant predictor of anxiety (Boelen & Reijntjes, 2008), over and above neuroticism.

One additional variable of interest is emotion regulation. Emotion regulation is a broad term, whose definition is contentiously discussed (Bloch, Moran, & Kring, 2010). Generally, emotion regulation encompasses processes that influence expression of emotional responses that are developed over time (Gross, 2014). The inability to appropriately regulate emotion has been described as emotion dysregulation (Bloch et al., 2010) and is considered to be transdiagnostic, common to many forms of psychopathology (Werner & Gross, 2010). Further, measures of the construct explain additional variance in anxiety symptoms, not accounted for by other general factors (Cisler, Olatunji, Feldner, & Forsyth, 2009), though it has not been examined as a mechanism underlying the link between neuroticism and anxiety.

The current study explored the relationship of three factors (shame, psychological inflexibility, and emotion dysregulation) as potential mechanisms underlying the association between neuroticism and anxiety (see Fig. 1), with multiple indices of anxiety as an outcome. Importantly, these three factors have been widely considered to be transdiagnostic (i.e., cutting across diagnostic categories) though we are unaware of any published research examining their associations with anxiety in the same model/study. While evaluating such factors in isolation may help to identify features associated with psychopathology, it says little about the utility of constructs over and above other established ones. This study aimed to concurrently evaluate these three, well-established, factors to determine statistical significance over and above effects of one another. Moreover, to date, no study has evaluated these factors, individually, or concurrently, as indirect explanatory variables underlying the link between neuroticism and anxiety in adolescents. We hypothesized that each of these three factors would represent distinct, though related, constructs and that each factor would, uniquely, explain the association between neuroticism and anxiety, over and above their shared variance.

2. Method

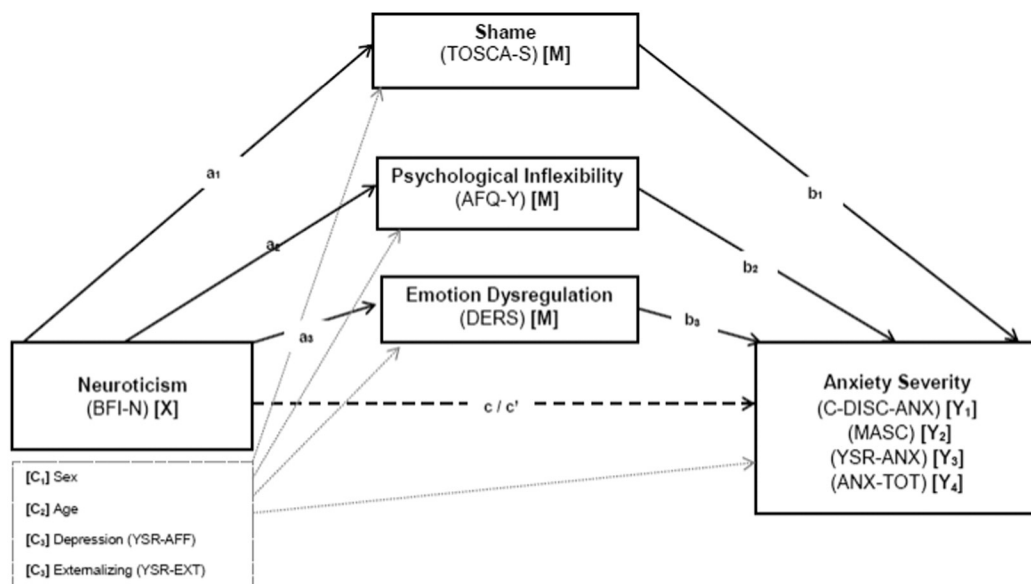
Data from 97 adolescents were available for the current study, collected as part of a larger research study evaluating emotions among

inpatient youth. The current data were collected from 2012 to 2015. Participants were recruited from an inpatient psychiatric unit that serves individuals with severe behavioral and emotional disorders who have not responded to previous interventions. Length of stay ranged from 15 to 86 days ($M = 37.81, SD = 12.45$). Inclusion criteria was sufficient proficiency in English to consent to research and complete the necessary assessments, and exclusion criteria were a diagnosis of schizophrenia or another psychotic disorder, an autism spectrum diagnosis, or an IQ of less than 70. 185 consecutive admissions to the hospital were approached for consent, 16 declined participation, 1 revoked consent, and 16 were excluded on the basis of the aforementioned criteria. Additionally, 55 participants were excluded due to missing data on one or more measures of interest. Therefore, the final sample consisted of 97 adolescents (ages 12–17; $M = 15.23, SD = 1.43$), including 63.9% females, and had the following ethnic breakdown: 77.3% White, 7.2% Hispanic, 2.1% Asian, and 13.4% mixed or other. Based on DSM-IV criteria, 74.4% were diagnosed with major depressive disorder, 26.7% ADHD, 26.7% social phobia, 28.9% obsessive compulsive disorder, 23.3% generalized anxiety disorder, 16.7% oppositional defiant disorder, 17.8% panic disorder, 14.4% agoraphobia, 15.6% separation anxiety disorder, 9% anorexia, 8.9% post-traumatic stress disorder, 2.2% bulimia, 15.6% conduct disorder, and 4.4% bipolar at admission. Additionally, 74.2% self-endorsed anxiety as a reason for their hospitalization.

The study was approved by the appropriate institutional review board. All adolescents admitted to an inpatient psychiatric unit were approached on the day of admission about participation. Informed consent was provided by parents first, and if granted, assent from adolescents was obtained. Adolescents were collectively assessed by doctoral-level clinical psychology students and/or trained clinical research assistants. The assessments were conducted independently and in private within the first two weeks following admission.

2.1. The computerized diagnostic interview schedule for children (C-DISC)

The C-DISC (Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000) is a structured computer-assisted diagnostic interview used to assess DSM-IV Axis I psychiatric disorders in children and adolescents. The number of symptoms for each anxiety disorder that were endorsed on



Note: a_i = Effect of X on M_i ; b_i = Effect of M_i on Y_i ; c = Total effect of X on Y_i ; c' = Direct effect of X on Y_i , controlling for M_i . Sex, age, depression, and externalizing are covariates.

Fig. 1. Proposed model.

the C-DISC was used as a composite index of anxiety severity (C-DISC-ANX), one of the outcome variables in this study.

2.2. Multidimensional Anxiety Scale for Children (MASC)

The MASC (March, Parker, Sullivan, Stallings, & Conners, 1997) is a transdiagnostic self-report measure of anxiety, containing 39 items, which are rated on a 4-point Likert scale from 0 (never true) to 3 (often true). It demonstrates good concurrent and predictive validity (March et al., 1997). MASC scores in this study had excellent internal consistency ($\alpha = 0.93$).

2.3. Youth self-report-anxiety problems (YSR)

The YSR (Achenbach, 1991) is a broad-band measure of psychopathology. The measure contains 112 problem items, each scored on a 3-point Likert scale (0 = not true, 1 = somewhat or sometimes true, or 2 = very or often true) and converted to *t* scores. The anxiety problem subscale (YSR-ANX) has been shown to predict the presence of an anxiety disorder in adolescents (Ferdinand, 2008). The affective problem subscale (YSR-AFF) corresponds to DSM-IV symptoms of major depressive disorder and dysthymia (Ferdinand, 2008). The externalizing scale (YSR-EXT) is a superordinate factor representing conflict with others and with others' expectations for behavior.

2.4. Big Five Inventory, Neuroticism (BFI-N)

The BFI (John, Donahue, & Kentle, 1991) is a 44-item self-report questionnaire assessing the Big Five personality dimensions. The BFI-N is made up of 8 phrases, which are rated on a 5-point Likert scale from 1 (Disagree Strongly) to 5 (Agree Strongly). All scales have been deemed reliable with a clear factor structure as well as convergent and discriminant validity (Benet-Martínez & John, 1998; John & Srivastava, 1999) and have been used in past studies with adolescents (Marks, Hine, Blore, & Phillips, 2008). BFI-N internal consistency was good in this sample ($\alpha = 0.84$).

2.5. The Test of Self-Conscious Affect – Adolescent Version (TOSCA)

The TOSCA (Tangney, Wagner, Gavlas, & Gramazow, 1991) is a 15-item self-report measure assessing global shame-proneness in adolescents and consists of various social scenarios of positive and negative valences to which participants must imagine their likely reaction. For each scenario, participants rate how likely they would be to respond in a given manner on a scale of 1 (not at all likely) to 5 (very likely). Responses are summed to a total shame-proneness scale (TOSCA-S). All TOSCA subscales have demonstrated good reliability and convergent validity with measures of psychopathology (Tangney & Dearing, 2002) among healthy adolescents. Internal consistency of the TOSCA-S was excellent in this sample ($\alpha = 0.90$).

Table 1
Means, standard deviations and bivariate correlations among variables ($n = 97$).

Variable	Mean/n (SD/%)	1	2	3	4	5	6	7	8	9	10	11
1. C-DISC-ANX	0.0 (1.0)	1										
2. MASC	59.3 (14.4)	.61**	1									
3. YSR-ANX	64.5 (9.7)	.61**	.71**	1								
4. ANX-TOT	0.0 (1.0)	.91**	.82**	.83**	1							
5. YSR-AFF	74.3 (12.2)	.42**	.49**	.59**	.54**	1						
6. YSR-EXT	61.2 (11.3)	-.02	-.03	.05	-.03	.20	1					
7. Age	15.2 (1.4)	-.19	-.16	-.23*	-.20	-.13	.09	1				
8. Sex (% female)	62 (63.9)	-.08	.10	.11	.01	.07	.29**	.32**	1			
9. BFI-N	3.9 (0.8)	.44**	.58**	.68**	.62**	.57**	.03	-.15	-.23*	1		
10. TOSCA-S	50.5 (12.3)	.46**	.57**	.61**	.61**	.45**	-.19	-.34**	-.28**	.52**	1	
11. AFQ-Y	33.7 (13.7)	.42**	.53**	.61**	.56**	.58**	.09	.04	.07	.57**	.57**	1
12. DERS	114.2 (28.5)	.31**	.45**	.47**	.42**	.62**	.19	-.16	-.13	.63**	.50**	.64**

* $p < .05$, ** $p < .01$; numbers across header correspond with variables numbered 1–11.

2.6. Avoidance and Fusion Questionnaire for Youth (AFQ-Y)

The AFQ-Y (Greco, Lambert, & Baer, 2008) is a 17-item self-report measure assessing psychological inflexibility. Responses are scored on a 5-point Likert scale from 0 (not at all true) to 4 (very true). The AFQ-Y has demonstrated adequate reliability and validity in adolescent samples (Greco et al., 2008). Internal consistency in this sample was good ($\alpha = .88$).

2.7. Difficulties in Emotion Regulation Scale (DERS)

The DERS (Gratz & Roemer, 2004) is a 36-item multidimensional self-report measure. Items are scored on a 5-point Likert scale from 1 (almost never [0–10%]) to 5 (almost always [91–100%]), with higher scores indicating greater difficulties in emotion regulation. The DERS has demonstrated adequate reliability and validity in a community sample of adolescents (Neumann, van Lier, Gratz, & Koot, 2010). Internal consistency for this sample was excellent ($\alpha = 0.94$).

Analyses were conducted using the PROCESS macro for SPSS v.20 (Hayes, 2012). Bootstrapping with 10,000 re-samples was performed to obtain 95% confidence intervals for the specific indirect effects. Effect sizes (K^2) were calculated for the specific indirect effects, (Preacher & Kelley, 2011). Using AMOS for SPSS 20 (Arbuckle, 2011), a composite latent variable (C-DISC-ANX) was created; this standardized value was imputed from the six variables indexing the number of diagnostic symptoms endorsed for each anxiety disorder (panic disorder, agoraphobia, social anxiety disorder, generalized anxiety disorder, specific phobia, and separation anxiety disorder), which was as a dependent variable. Additionally, a total composite 'anxiety severity' variable (ANX-TOT) was created using the aforementioned six symptom count variables, the MASC, and the YSR-ANX as indicators. The association between neuroticism and anxiety with three indirect explanatory variables (shame, psychological inflexibility, and emotion dysregulation) was tested with three separate indices of anxiety (MASC, YSR-ANX, C-DISC-ANX) as well as the composite outcome (ANX-TOT).

3. Results

No outliers were discovered, as distributions approximated normality with all total score values demonstrating acceptable values of skewness and kurtosis ($< |1.40|$). There was no indication of collinearity among the direct and indirect predictors. Means and standard deviation are provided in Table 1. The total (path c) and direct (path c') effects of BFI-N on each outcome are presented in Table 2.

For all models tested, there were significant specific indirect effects (path a * b) of BFI-N via TOSCA-S (β 's between .07–.11; see Table 3); effect sizes (K^2 between .06–.12) were medium in size. Indirect effects of BFI-N via DERS and AFQ-Y, respectively, were non-significant in all models. To test the specificity of the indirect effects, competing models were run, using the MEDIATE macro for SPSS (Hayes & Preacher, 2014),

Table 2
Standardized regression coefficients.

Y	Model	β	SE	p	CI (l)	CI (u)
C-DISC-ANX	BFI-N → TOSCA-S (a ₁)	.30	.10	.004	.10	.50
	BFI-N → AFQ-Y (a ₂)	.41	.10	<.001	.21	.61
	BFI-N → DERS (a ₃)	.38	.09	<.001	.20	.57
	TOSCA-S → C-DISC-ANX (b ₁)	.22	.13	.106	-.05	.48
	AFQ-Y → C-DISC-ANX (b ₂)	.18	.14	.202	-.10	.47
	DERS → C-DISC-ANX (b ₃)	-.18	.14	.193	-.45	.09
	BFI-N → C-DISC-ANX (c)	.28	.12	.018	.05	.51
	BFI-N → C-DISC-ANX (c')	.21	.13	.108	-.05	.47
	BFI-N → TOSCA-S (a ₁)	.30	.10	.004	.10	.50
	BFI-N → AFQ-Y (a ₂)	.41	.10	<.001	.21	.61
MASC	BFI-N → DERS (a ₃)	.38	.09	<.001	.20	.57
	TOSCA-S → MASC (b ₁)	.36	.11	<.001	.15	.58
	AFQ-Y → MASC (b ₂)	.05	.12	.672	-.18	.28
	DERS → MASC (b ₃)	-.01	.11	.925	-.23	.21
	BFI-N → MASC (c)	.54	.10	<.001	.34	.74
	BFI-N → MASC (c')	.42	.11	<.001	.21	.63
	BFI-N → TOSCA-S (a ₁)	.30	.10	.004	.10	.50
	BFI-N → AFQ-Y (a ₂)	.41	.10	<.001	.21	.61
	BFI-N → DERS (a ₃)	.38	.09	<.001	.20	.57
	TOSCA-S → YSR-ANX (b ₁)	.32	.09	<.001	.15	.49
YSR-ANX	AFQ-Y → YSR-ANX (b ₂)	.15	.09	.118	-.04	.34
	DERS → YSR-ANX (b ₃)	-.16	.09	.079	-.34	.02
	BFI-N → YSR-ANX (c)	.61	.08	<.001	.45	.78
	BFI-N → YSR-ANX (c')	.52	.09	<.001	.35	.69
	BFI-N → TOSCA-S (a ₁)	.30	.10	.004	.10	.50
	BFI-N → AFQ-Y (a ₂)	.41	.10	<.001	.21	.61
	BFI-N → DERS (a ₃)	.38	.09	<.001	.20	.57
	TOSCA-S → ANX-TOT (b ₁)	.37	.10	<.001	.16	.57
	AFQ-Y → ANX-TOT (b ₂)	.13	.11	.255	-.09	.35
	DERS → ANX-TOT (b ₃)	-.19	.11	.083	-.40	.03
ANX-TOT	BFI-N → ANX-TOT (c)	.51	.10	<.001	.32	.71
	BFI-N → ANX-TOT (c')	.42	.10	<.001	.22	.62

which allows for the examination of the direct, indirect, and total effects of multiple predictors on an outcome variable through a proposed mediator. Reverse models revealed non-significant indirect effects of TOSCA-S via BFI-N (β 's between .02–.05) in all models (i.e., confidence intervals contained 0).

4. Discussion

This study evaluated the association between neuroticism and anxiety among adolescents with three indirect explanatory variables: shame, psychological inflexibility, and emotion dysregulation. In line with predictions, neuroticism was significantly associated with all three proposed mediators and with all indices of anxiety. Partially consistent with hypotheses, neuroticism had significant indirect effects via shame in all models tested; yet, there were no significant effects of

neuroticism via psychological flexibility or emotion regulation. This pattern was consistent when looking at diagnostic symptoms endorsed on the C-DISC as the outcome (model 1) as well as two transdiagnostic self-report measures of anxiety symptoms (models 2–3) and a composite outcome variable comprised of the dependent variables of models 1–3 (model 4). These effects were significant when controlling for age, sex, depression, and externalizing and, as evidenced by K^2 , the indirect effects of neuroticism via shame were of medium size. Reverse models were run, yielding non-significant effects, adding confidence to the specified model with shame as the indirect variable between neuroticism and anxiety.

Given that neuroticism is a broad personality factor that is related to many forms of psychopathology (Widiger et al., 2009) the current study may provide some degree of specificity with regard to the effect of how neuroticism may manifest into anxiety. Specifically, increased neuroticism is associated with greater shame, which, in turn, is associated with greater anxiety, though future work is needed to evaluate such associations longitudinally. Importantly, these results appear to be specific to shame, and not 'general distress' as there were no significant associations of neuroticism via psychological inflexibility or emotion dysregulation. Indeed, neuroticism was highly correlated with shame, psychological inflexibility, and emotion dysregulation, which, in turn, were all correlated with all indices of anxiety. Nevertheless, evaluating all three of these factors concurrently identified shame as the only significant mediator of the neuroticism/anxiety association, over and above the effects of psychological inflexibility and emotion dysregulation. Such findings suggest that shame may be an important target among adolescents with increased neuroticism and/or anxiety. Indeed, psychological inflexibility and emotion dysregulation are well-established transdiagnostic constructs that are consistently associated with anxiety, though the current results suggest that shame may warrant clinical attention. These findings echo calls (e.g., Brown & Naragon-Gainey, 2013) to consider multiple risk factors in models concurrently. Although many risk factors might correlate or predict symptoms in isolation, models including multiple mid-level factors allow for investigations of predictors' strength over and above other relevant factors, bolstering confidence in results.

For adolescents, in general, shame is related to self-esteem during this key period of development (Reimer, 1996) and some have dubbed it a "fundamental" factor in psychotherapy with adolescents, noting the effects of shame on development (Anastasopoulos, 1997). Overt therapeutic focus on shame could be a fruitful avenue for anxiety treatment, or the prevention of anxiety development in this population. Shame has been associated with negative beliefs about one's self/ideas (Matos, Pinto-Gouveia, & Duarte, submitted for publication) consistent with the negative thinking styles of anxiety disorders (e.g., Barlow, Allen, & Choate, 2004) and concentrating on such maladaptive expectations could potentially alter the trajectory of at-risk youth who are prone to shame. It is important for future work to examine additional forms of psychopathology to see if shame explains the associations with neuroticism, or if it is unique to anxiety, as it is possible that shame is a broad factor linking neuroticism with other forms of psychological distress.

With regard to the association between general risk factors and specific manifestations, investigating 'semi-specific factors' (e.g., shame) that explain such associations is imperative, as treatments are being developed, which focus on specific crosscutting features that underlie disorders, rather than symptom-clusters themselves (e.g., Luoma, Kohlenberg, Hayes, & Fletcher, 2012) have been developed with the goal of impacting specific mechanisms in treatment. In addition to developing these interventions, it is important for research to identify specific mechanisms in operation, as well as the populations for which they are most relevant.

Indeed, calls have been made for a shift in paradigm for nosological systems. One such proposal is the NIMH Research Domain Criteria (RDoC), which seeks new ways of defining and classifying psychological disorders by utilizing crosscutting features that highlight the overlap

Table 3
General and specific indirect effects.

Y	Model	β	SE	CI (l)	CI (u)	K^2
C-DISC-ANX	M ₁₋₃ : Total indirect effect	.07	.07	-.05	.23	
	M ₁ : TOSCA-S	.07	.04	.01	.18	.06
	M ₂ : AFQ-Y	.08	.06	-.02	.23	.07
	M ₃ : DERS	-.07	.05	-.21	.01	.04
MASC	M ₁₋₃ : Total indirect effect	.13	.07	.01	.27	
	M ₁ : TOSCA-S	.11	.05	.04	.22	.12
	M ₂ : AFQ-Y	.02	.05	-.07	.15	.02
	M ₃ : DERS	-.01	.04	-.09	.06	.01
YSR-ANX	M ₁₋₃ : Total indirect effect	.10	.06	-.01	.22	
	M ₁ : TOSCA-S	.10	.04	.03	.21	.11
	M ₂ : AFQ-Y	.06	.04	-.01	.17	.07
	M ₃ : DERS	-.06	.04	-.17	.01	.06
ANX-TOT	M ₁₋₃ : Total indirect effect	.09	.07	-.03	.23	
	M ₁ : TOSCA-S	.11	.05	.04	.23	.12
	M ₂ : AFQ-Y	.05	.05	-.02	.18	.06
	M ₃ : DERS	-.07	.05	-.19	.01	.08

commonly displayed between current diagnostic categories (Insel et al., 2010). And, in line with RDoC, research has increasingly shifted to focus on transdiagnostic features. By investigating psychopathology at the level of features rather than clusters of defined symptoms/syndromes, a more fine-grained understanding of the development of psychopathology can be expected, particularly for conditions that share common general factors, such as neuroticism.

There are additional limitations for this study. First, this data was archival and was limited to only three potential transdiagnostic factors; future work should examine others (for review, see Norton & Paulus, in press). Additionally, sample size limited the number of paths that could be estimated and the current study was underpowered for more sophisticated analyses. Future work should seek to replicate findings across specific emotional disorder symptomologies and do so in other samples to examine generalizability (e.g., outpatient adults), particularly since this sample was of poor racial/ethnic diversity and may not be representative of other samples. Nevertheless, anxiety represents a large disease burden in these settings, justifying the importance of the current work aimed at identifying underlying processes.

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