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The cognitive-interpersonal model of disordered eating: A test of the mediating role of alexithymia

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Abstract

Objective: The cognitive-interpersonal model proposes that high levels of attention to detail and cognitive rigidity confer risk for the development of eating disorders (EDs) and that socioemotional deficits, such as alexithymia, contribute to their maintenance. However, no studies have examined the direct and indirect relationships of these constructs. We investigated the mediating role of specific alexithymia traits (difficulties describing feelings, difficulties identifying feelings, and externally oriented thinking) on the relationship between attention to detail, cognitive rigidity, and ED symptoms while controlling for anxiety and depression symptoms.

Method: Four hundred and one nonclinical female participants (M = 20.57, SD = 4.99 years old) completed self-report measures assessing the variables of interest.

Results: Path analyses revealed that difficulties identifying feelings was the only significant mediator between attention to detail and cognitive rigidity to ED symptoms. However, these mediation effects became nonsignificant after controlling for anxiety and depression.

Conclusions: Difficulties identifying feelings may in part underlie the relationship between attention to detail and cognitive rigidity and ED symptoms, providing support for the cognitive-interpersonal model. However, these relationships are heavily influenced by anxiety and depression symptoms. Enhancing individual's ability to identify emotional states may help to decrease ED symptoms for individuals who report high levels of attention to detail and cognitive rigidity.

KEYWORDS

alexithymia, attention to detail, cognitive rigidity, eating disorders

1 | INTRODUCTION

The cognitive-interpersonal maintenance model proposes that obsessive–compulsive personality traits characterized by high levels of attention to detail and cognitive rigidity, in combination with difficulties in socioemotional processing, such as alexithymia, confer vulnerability for the development and maintenance of eating disorder (ED) symptoms (Crane, Roberts, & Treasure, 2007; Lang, Lopez, Stahl, Tchanturia, & Treasure, 2014; Treasure & Schmidt, 2013). Considerable evidence supports the view that attention to detail and cognitive rigidity

represent endophenotypic traits in EDs, which persist independent of the status of the illness (Zhou, McAdam, & Donnelly, 2018). Understanding what factors may mediate the development of EDs for individuals with this cognitive style is of importance; however, no studies to date have examined the mediating role of socioemotional deficits between cognitive style and ED symptoms through statistical techniques such as path analysis. This omission is significant given the central role of socioemotional processing deficits in the cognitive-interpersonal model (Treasure & Schmidt, 2013). Accordingly, the current study assessed for the first time the relationships between attention to detail and cognitive rigidity with ED symptoms in a large sample of females and whether alexithymia traits mediated these relationships.

1.1 | Cognitive style

High levels of cognitive rigidity and attention to detail are well-documented within clinical ED populations (Lang et al., 2014; Wu et al., 2014). It is theorized that this cognitive style predisposes individuals to meticulous attention to detail in planning and organization, sensitivity to order and systems, and fear change and making mistakes (Schmidt & Treasure, 2006). Within the context of EDs, cognitive rigidity makes individuals more susceptible to inflexible rules regarding food preparation, while their eye for detail makes aspects of appearance more salient and results in highly detailed weight control rituals (Lang, Roberts, et al., 2016). Consequently, these individuals may be more prone to experience dietary restraint and body dissatisfaction due to their detail-oriented processing and propensity for all-or-nothing thinking (Treasure & Schmidt, 2013).

Further support for the role of this cognitive style comes from research documenting cognitive rigidity and attention to detail in weight-restored and recovered ED populations (Lang et al., 2014; Lang, Roberts, et al., 2016; Tchanturia et al., 2012). Additionally, first-degree unaffected relatives of individuals with anorexia nervosa (AN) demonstrate greater difficulties with set-shifting and global processing when compared with healthy controls (Lang, Roberts, et al., 2016; Lang, Treasure, & Tchanturia, 2016). Collectively, these clinical findings provide support for the view that this cognitive style represents an endophenotype for EDs (Zhou et al., 2018).

Given its potential significance for EDs, accurate and efficient assessment of this cognitive style is of considerable clinical interest. Neuropsychological tests, such as the Wisconsin Card Sorting Task (Grant & Berg, 1948) and Group Embedded Figures Task (Witkin, Oltman, Raskin, & Karp, 1971), provide an objective estimation of cognitive rigidity and attention to detail and are frequently employed within research in ED populations. However, the time-consuming nature of these tests limits their feasibility in clinical practice. Self-report measures have the potential to provide a more efficient way to gain information about an individual's subjective experience of cognitive rigidity and attention to detail.

The Detail and Flexibility Questionnaire (DFlex) is one such self-report questionnaire designed to measure cognitive rigidity (difficulty with set-shifting/flexibility) and attention to detail (weak coherence; Roberts, Barthel, Lopez, Tchanturia, & Treasure, 2011). Several studies of ED patients have reported high scores on the DFlex cognitive rigidity and attention to detail subscales (Lang et al., 2015; Tchanturia, Larsson, & Adamson, 2016; Westwood, Mandy, & Tchanturia, 2017). Within non-clinical ED populations, to our knowledge, only one study has used the DFlex. Arlt et al. (2016) examined the relationship between the DFlex cognitive rigidity subscale and ED symptoms in a large sample of university students ($N = 461$, 63.12% female). Results showed that cognitive rigidity was positively correlated with ED symptoms and predicted ED symptoms when controlling for gender and social anxiety symptoms. Although these findings demonstrate an association between cognitive rigidity and ED symptoms, the role of attention to detail as measured by the DFlex was not examined. This is significant, as the cognitive-interpersonal model (Treasure & Schmidt, 2013) posits that high levels of cognitive rigidity likely accentuate attention to detail due to the difficulties in switching attention from detail focused to global processing, thereby exacerbating this cognitive style (Harrison, Tchanturia, Naumann, & Treasure, 2012). Thus, examining the contribution of attention to detail and cognitive rigidity in relation to ED symptoms simultaneously is important.

1.2 | Alexithymia

In exploring what factors may mediate the development of an ED in the context of high levels of cognitive rigidity and attention to detail, the potential role of alexithymia warrants attention. Alexithymia is a trait characterized by difficulties describing and identifying one's and other's feelings, poor introspective thinking, and impaired ability to differentiate internal states from bodily sensations (Guillén et al., 2014; Taylor, Bagby, & Parker, 1999). Individuals with alexithymia tend to avoid attending to their internal experiences, show impairments in interpreting interoceptive signals, such as hunger and satiety, and

confuse these bodily sensations with emotions (Treasure & Schmidt, 2013). The onset of ED symptoms may be associated with the use of strategies employed in an attempt to regulate affective experiences (Treasure, Corfield, & Cardi, 2012). Given that alexithymia is associated with deficits in the cognitive-experiential component of emotion response systems (subjective awareness of emotions) and at the level of interpersonal regulation of emotion (verbal communication of emotional distress), individuals may resort to maladaptive self-stimulatory behaviours, such as starving or bingeing, to self-regulate emotional states and internal experiences (Speranza, Loas, Wallier, & Corcos, 2007). Luminet, Bagby, and Taylor (2018) in their review of the relationship between alexithymia and EDs suggest that alexithymia traits are positively associated with ED symptoms and propose that alexithymia may indirectly contribute disordered eating, by influencing personality characteristics such as ineffectiveness, interpersonal distrust, maturity fears, and perfectionism, which in turn may affect eating behaviour.

Research suggests that alexithymia is associated with specific deficits in executive functioning, similar to the cognitive style implicated in the cognitive-interpersonal model (Luminet et al., 2018). Zhu, Wang, Huang, Yao, and Tang (2006) compared scores on the Wisconsin Card Sorting Task between individuals with high and low alexithymia scores. Results showed that compared with the low group, the group with higher alexithymia scores made significantly more perseverative errors and perseverative responses. Such findings suggest that elevated alexithymia may also contribute to rigid mental acts. Further, the externally oriented subscale of the TAS-20 assesses a cognitive style characterized by a preference for external details as a consequence of deficits in the mental representation of emotions (Taylor et al., 1999). This operational cognitive style resembles the cognitive style implicated in the cognitive-interpersonal model, wherein the preoccupation with highly detailed weight control rituals facilitates avoidance from attending to emotional experiences (Treasure & Schmidt, 2013). Additionally, as previously mentioned, the presence of cognitive rigidity would likely accentuate this detail-oriented style, due to the difficulties in switching attention from detail-oriented thinking to "bigger picture" thinking.

A recent systematic review and meta-analysis of 44 studies of alexithymia in EDs (Westwood, Kerr-Gaffney, Stahl, & Tchanturia, 2017) concluded that individuals with AN and bulimia nervosa (BN) endorsed significantly more alexithymia traits, as measured by the Toronto Alexithymia Scale-20 (TAS-20; Bagby, Parker, & Taylor, 1994), compared with healthy controls ($d = 1.44$ and $d = 1.26$, respectively). In studies of AN, large effects were observed for the TAS-difficulty identifying feelings subscale ($d = 1.57$) and difficulty describing feelings subscale ($d = 1.11$), and small effects were observed for the externally oriented thinking subscale ($d = .48$). Within BN, large effects were observed for the TAS-difficulty identifying feelings ($d = 1.58$) and difficulty describing feelings subscales ($d = .89$) when compared with controls; however, no significant differences were observed for the externally oriented thinking subscale ($d = .02$).

Within nonclinical ED populations, research suggests that individuals with higher ED symptoms report significantly higher TAS-20 total scores compared with individuals with low ED symptoms (Alpaslan et al., 2015; Ridout, Thom, & Wallis, 2010), and TAS-Total scores are positively associated with ED symptoms (De Berardis et al., 2007; De Berardis et al., 2009). Similar to the findings within BN, nonclinical samples report significant correlations between difficulties identifying and describing feelings but not externally oriented thinking, with ED symptoms (Alpaslan et al., 2015; De Berardis et al., 2007; De Berardis et al., 2009).

The finding that the externally oriented thinking subscale is less consistently related to ED symptoms may suggest that disordered eating is associated with aspects of alexithymia that reflect difficulties in the cognitive processing of emotions, not an operational cognitive style. The externally oriented subscale reflects a concrete cognitive style in which a focus on the external details of everyday life is preferred over a focus on one's inner experiences (Preece, Becerra, Allan, Robinson, & Dandy, 2017). However, it is also possible that the lack of consistent findings between the externally oriented thinking subscale and disordered eating may be accounted for by the relatively low-reliability estimates observed for this subscale (Westwood, Kerr-Gaffney, et al., 2017).

Only 19 of the 44 studies included in Westwood, Mandy, et al.'s (2017) review controlled for depression, and six of these also controlled for anxiety when comparing differences between the ED and control groups on the TAS-20. Of those 19 studies, the results only remained significant in eight studies. Further, research suggests that depression and anxiety are related to alexithymia. Li, Zhang, Guo and Zhang's (2015) meta-analysis investigated the relationship between depression severity and TAS-20 scores in 19 studies across nonclinical and depressed groups. The authors reported moderate correlations between depression severity and the difficulty describing feelings and difficulty identifying feelings subscales but only weak correlations between depression severity and externally oriented subscale. These findings suggest that alexithymia as assessed by the TAS-20, specifically the difficulty describing feelings and difficulty identifying feelings subscales, is closely

related to depression. Luminet et al. (2018) in their narrative review of the literature regarding the relationships between alexithymia, depression, and anxiety report that the prevalence rate of alexithymia in depressive disorders and several anxiety disorders is moderately high and cannot be attributed entirely to shared diagnostic variance between these disorders and the alexithymia construct. Given the established links between alexithymia, depression, and anxiety and specific criticisms that the TAS-20 may assess aspects of negative affect, the importance of controlling for anxiety and depression symptoms is apparent (Luminet, Bagby, & Taylor, 2001; Taylor & Bagby, 2004).

1.3 | Rationale for the current study

Based on the cognitive-interpersonal model of EDs, existing research supports the proposed relationships depicted in Figure 1. Namely, research findings have consistently reported significant associations between attention to detail, cognitive rigidity, difficulties identifying feelings, and difficulties describing feelings and ED symptoms (Westwood, Kerr-Gaffney, et al., 2017; Zhou et al., 2018). However, several unresolved issues remain. To our knowledge, no studies have examined these constructs together despite them all being theoretically implicated in the cognitive-interpersonal model. Past research has not controlled for the potential confounding effects of anxiety and depression on alexithymia scores and has not examined the unique relationships between the three subscales of the TAS-20 (difficulty describing feelings, difficulty identifying feelings, and externally oriented thinking) to ED symptoms. This is significant in light of the findings from Li et al.'s (2015) meta-analysis that demonstrated that the degree of alexithymia is related to depression severity.

Whereas the cognitive-interpersonal model primarily focused on the relationships between cognitive and socio-emotional processes in the maintenance of AN, the model has been applied trans-diagnostically as an intervention for carers in the context of AN, BN, or eating disorder not otherwise specified (Goddard et al., 2011) and in the treatment for eating disorder not otherwise specified (Goddard et al., 2013). Furthermore, the model has been applied to the development of EDs such that at attention to detail and cognitive rigidity are proposed to represent endophenotypes for EDs (Treasure & Schmidt, 2013). Similarly, alexithymia is thought to indirectly contribute to the development of ED symptoms by influencing traits, such as cognitive rigidity and attention to detail, which influence the development of EDs (Luminet et al., 2018). As such, we were interested in examining these as potential predisposing for the development of an ED, as outlined in the cognitive-interpersonal model, in a nonclinical but at-risk population of young female university students.

Therefore, this study aimed to address these gaps by testing all paths in a combined model while controlling for anxiety and depressive symptoms. Because of the lack of consistent evidence for a direct relationship between externally oriented thinking and ED symptoms, it was hypothesized that ED symptoms would be directly predicted by cognitive rigidity, attention to detail, difficulty identifying feelings, and difficulties describing feelings. Furthermore, it was hypothesized that cognitive rigidity and attention to detail would indirectly predict ED symptoms via difficulty identifying feelings, difficulties describing feelings, and externally oriented thinking.

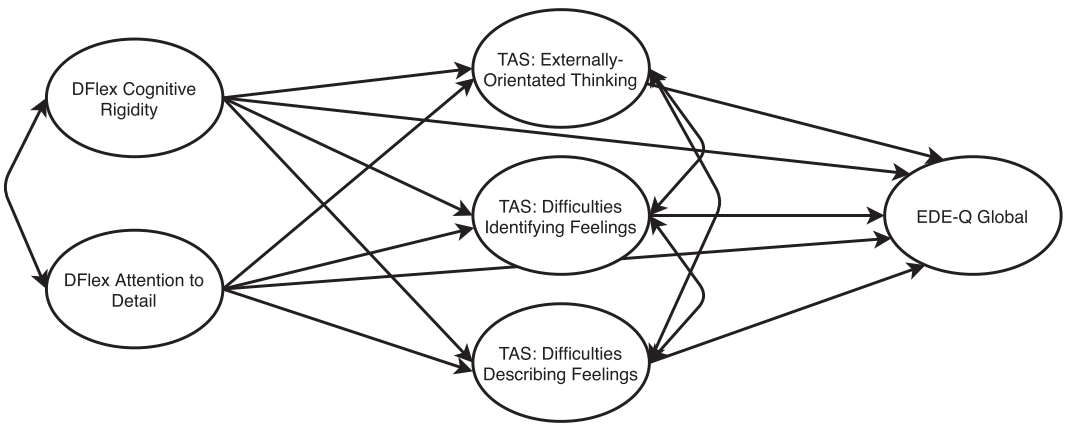

FIGURE 1 Conceptual model of the proposed relationships between cognitive rigidity, attention to detail, alexithymia traits, and eating disorder symptoms

2 | METHOD

2.1 | Participants

Four hundred and one nonclinical female participants (98.5% self-identified as students) aged between 18 and 57 years (M = 20.57, SD = 4.99) were recruited from an Australian university. Inclusion criteria for the study were females aged 18 years and over. There were no exclusion criteria. The mean self-reported body mass index for the sample was 21.98 kg/m^2 (SD = 4.71). Participants reported their ethnicity as Asian (45.20%), Caucasian (40.10%), and Middle Eastern (3.0%), with other ethnic groups comprising the remainder of the sample (11.60%). Most participants reported their relationship status as single (76.10%), followed by being in a monogamous or de facto relationship (23.90%). Given the large proportion of university students, most participants' highest completed education level was secondary education (75.10%), although some had completed tertiary qualifications (24.90%). Most participants were full-time students (59.6%), with the remainder reporting working either full-time, part-time, or on a casual basis (37.7%), or being unemployed (2.2%).

2.2 | Measures

2.2.1 | Detail and Flexibility Questionnaire

The DFlex is a 24-item self-report scale composed of two subscales: Cognitive Rigidity (difficulty with set-shifting/flexibility) and Attention to Detail (weak coherence). Respondents report to what extent they agree with statements (such as "I can get lost in the details and often forget the real purpose of the task") on a 5-point Likert scale from 1 = *strongly disagree* to 5 = *strongly agree*. The DFlex has demonstrated good internal consistency (α = .91), and strong discriminant validity (Roberts et al., 2011). In the current study, the Cronbach alpha for the Cognitive Rigidity subscale was α = .85, and Attention to Detail subscale α = .83.

2.2.2 | Toronto Alexithymia Scale

The TAS-20 is a 20-item self-report questionnaire composed of three subscales: (a) difficulty describing feelings, (b) difficulty identifying feelings, and (c) externally oriented thinking. Responses to items (such as "I am often confused what I am feeling") are rated on a 5-point Likert scale from 1 = *strongly agree* to 5 = *strongly disagree*. The TAS-20 has demonstrated good internal consistency, adequate test–retest reliability, and the three-factor structure of the TAS-20 has been replicated in ED population and community samples (Loas et al., 2001). Although the authors of the TAS-20 (Bagby et al., 1994) argue that the preferred approach is to use the full-scale score, evidence from confirmatory factor analyses found that a three-factor model (difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking) is the best fitting model (Meganck, Vanheule, & Desmet, 2008). Therefore we chose to use the subscales of the TAS-20, in place of the full-scale score. In the current study, Cronbach's alpha values were difficulty describing feelings subscale α = .74, difficulty identifying feelings subscale α = .85, and externally oriented thinking subscale α = .62.

2.2.3 | ED Examination Questionnaire 6.0

The ED Examination Questionnaire (EDE-Q; Fairburn & Beglin, 2008) is a 36-item self-report questionnaire that assesses both the attitudinal and behavioural features of EDs within the last 4 weeks. The EDE-Q is composed of four subscales: (a) restraint, (b) eating concern, (c) shape concern, and (d) weight concern. To obtain subscale scores, the ratings for the relevant items are added together and the sum is divided by the total number of items forming the subscale. The global score is the sum of the four subscale scores divided by the number of subscales. Responses are rated on a 7-point response scale where participants endorse the frequency and severity of ED-related behaviours and cognitions. The EDE-Q has demonstrated good internal consistency in community settings (Mond, Hay, Rodgers, Owen, & Beumont, 2004). Within the current study, the Cronbach alpha for the EDE-Q global score was α = .95. Only the EDE-Q global score was used in the path analyses in the current study as evidence suggests that the EDE-Q factor structure is most appropriately represented as a unitary construct (Allen, Byrne, Lampard, Watson, & Fursland, 2011).

2.2.4 | Hospital Anxiety and Depression Scale

The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) is a 14-item questionnaire composed of two subscales to assess depression and anxiety symptoms within the last week. Items on the HADS are rated on 4-point phrases such as 0 = *not at all* and 3 = *most of the time*. The HADS has demonstrated good internal consistency (Bjelland, Dahl, Haug, & Neckelmann, 2002). In the current study, the Cronbach alpha

for the HADS-Anxiety subscale was α = .83 and α = .79 for the HADS-Depression subscale.

2.3 | Procedure

Informed consent was obtained from all participants prior to the commencement of the study. Participants were then asked to complete an online questionnaire at their convenience and received course credit in return for their participation. Ethical approval for the current study was obtained from the University of Melbourne Ethics Committee.

2.4 | Statistical analyses

Bivariate and partial correlations adjusted by anxiety and depression symptoms were carried out to assess the relationship between ED symptoms, attention to detail, cognitive rigidity, and alexithymia traits using IBM SPSS 26.0. Additionally, path analyses were conducted in Mplus (Muthén & Muthén, 1998) to evaluate the model proposed in Figure 1. In this model, alexithymia traits were added as potential mediators for the relationships between attention to detail and cognitive rigidity (independent variables) with global ED symptom severity as the dependent variable. Anxiety and depression were added as covariates for any variables that were significantly correlated in the proposed model. Two-tailed significance testing ($p < .05$) was used for all analyses. Parameter estimates for indirect effects were evaluated using bias-corrected bootstrapping with 10,000 resamples, due to the nonnormal distribution (MacKinnon, Lockwood, & Williams, 2004). To assess model fit, the comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square (SRMR) were chosen. These fit indices were selected as they are considered to be among the best indicators of model fit (Wang & Wang, 2012). Indicators for acceptable model fit were CFI and TLI values ≥.90, RMSEA values ≤.06 with a 90% CI where the lower limit contains or is close to 0 and the upper limit is less than .08, and SRMR values <.08 (Hooper, Coughlan, & Mullen, 2008).

3 | RESULTS

3.1 | Data cleaning

Data were inspected for missingness and deemed acceptable with less than 5% missing for all variables and a pattern consistent with missing completely at random; $\chi^2(47) = 49.08$, $p = .35$. Expectation maximization was employed to replace any missing values (Tabachnick, Fidell, & Ullman, 2007). All variables were normally distributed, and, therefore, no transformations were applied.

3.2 | Associations between variables assessed

Descriptive statistics, bivariate, and partial correlations (adjusting for anxiety and depression) between the variables of interest are displayed in Table 1. The EDE-Q global mean for the sample was in the 70th percentile in reference to normative data for young Australian women (Mond, Hay, Rodgers, & Owen, 2006). All variables were significantly associated with each other, apart from the TAS-externally oriented thinking subscale and EDE-Q subscale scores. As shown in Table 1, the relative magnitude of the correlations decreased after controlling for anxiety and depression. The DFlex attention to detail and cognitive rigidity subscales were significantly related to all the TAS-20 subscales at varying magnitudes.

3.3 | Model results

The direct and indirect effects of the initial proposed model are shown in Table 2. As can be seen in this model (Figure 2), several of our proposed relationships were not significant. As the initial model proposed was just-identified (all degrees of freedom were consumed), a model trimming approach was adopted to remove any nonsignificant paths in the interest of parsimony. The revised and more parsimonious model was found to fit the data well, with all significant paths in the original model remaining significant, $\chi^2(df = 3)$ 7.23, $p = .065$, CFI = .991, TLI = .959, RMSEA = .059, 90% CI [.000, .116], SRMR = .016. See Figure 3 for a graphical representation for the final model. Components of this final more parsimonious model are discussed in turn.

3.4 | Path analyses

3.4.1 | Cognitive style, alexithymia traits, and ED symptoms

The DFlex-cognitive rigidity scores significantly predicted EDE-Q global scores ($\beta = .265$, $p < .001$). TAS-difficulty identifying feelings subscale significantly predicted EDE-Q global scores ($\beta = .197$, $p < .001$). These significant predictors accounted for 16% of the variance in ED symptoms.

TABLE 1 Descriptive statistics, Pearson correlation coefficients, and partial correlations for the study variables

	Mean (*SD*)	1	2	3	4	5	6	7	8	9	10
1. EDE-Q global	2.00 (1.30)	—	.79***	.85***	.92***	.92***	.04	.11*	.12*	.11*	.18***
2. EDE-Q restraint subscale	1.60 (1.42)	.81***	—	.62***	.58***	.55***	.05	.09	.06	.05	.12*
3. EDE-Q eating concern subscale	1.31 (1.25)	.88***	.66***	—	.70***	.71***	.04	.09	.14**	.16**	.18***
4. EDE-Q shape concern subscale	2.75 (1.56)	.94***	.63***	.76***	—	.90***	−.01	.12*	.10*	.11*	.15**
5. EDE-Q weight concern subscale	2.42 (1.60)	.93***	.61***	.76***	.91**	—	.04	.10*	.12*	.09	.18***
6. TAS externally oriented thinking	18.79 (4.49)	.05	.07	.06	.00	.05	—	.23***	.18***	.24***	.12*
7. TAS difficulty describing feelings	14.11 (4.27)	.26***	.20***	.25***	.26***	.23***	.24***	—	.55***	35***	.25***
8. TAS difficulty identifying feelings	17.84 (6.14)	.34***	.22***	.37***	.33***	.32***	.17**	.63***	—	.39***	.36***
9. DFlex attention to detail	38.86 (9.43)	.30***	.18***	.34***	.29***	.26***	.21***	.44***	.54***	—	.69***
10. DFlex cognitive rigidity	41.61 (9.86)	.38***	.26***	.38***	.35***	.35***	.10	.38***	.55***	.76***	—

Note: Partial correlation coefficients while controlling for anxiety and depression scores are displayed on the top half of the diagonal.
Abbreviations: SD, standard deviation; EDE-Q, Eating Disorder Examination Questionnaire; TAS, Toronto Alexithymia Scale; DFlex, Detail and Flexibility Questionnaire.
*$p < .05$.; **$p < .01$.; ***$p < .001$ (two-tailed).

3.4.2 | Cognitive style and alexithymia traits

The DFlex-attention to detail subscale significantly predicted the TAS-externally oriented thinking subscale (β = .208, $p < 001$), the TAS-difficulty describing feelings subscale (β = .444, $p < .001$), and the TAS-difficulty identifying feelings subscale (β = .336, $p < .001$). The DFlex-cognitive rigidity scale significantly predicted the TAS-difficulty identifying feelings subscale (β = .336, $p < .001$). When controlling for anxiety and depression symptoms, the TAS-difficulty identifying feelings to EDE-Q global path became nonsignificant (β = .068, $p = .239$).

3.5 | Mediation effects

Examination of the indirect effects revealed significant total indirect effects from DFlex-attention to detail to EDE-Q global (β = .066, 95% CI [.004, .017]) and from DFlex-cognitive rigidity to EDE-Q global (β = .054, 95% CI [.03, .013]). Further exploration of these indirect effects showed significant indirect effects from DFlex-attention to detail → TAS-difficulty identifying feelings → EDE-Q global (β = .066, 95% CI [.028, .119]) and DFlex-cognitive rigidity → TAS-difficulty identifying feelings → EDE-Q global (β = .054, 95% CI [.021, .100]). However, both indirect effects were nonsignificant after controlling for anxiety and depressions scores (β = .023, 95% CI [−.002, .009]) and (β = .019, 95% CI [−.001, .007]), respectively.

4 | DISCUSSION

This study investigated the mediating role of specific alexithymia traits on the relationship between attention to detail, cognitive rigidity, and ED symptoms while controlling for anxiety and depression symptoms. Our findings provided partial support for our model outlined in Figure 1 and the cognitive-interpersonal maintenance model more broadly (Treasure & Schmidt, 2013). Specifically, we found positive correlations between attention to detail, cognitive rigidity, and all three alexithymia traits, and all variables of interest were directly related to ED symptoms, except for externally oriented thinking. However, significant indirect effects of cognitive rigidity and attention to detail on ED symptoms via difficulty

TABLE 2 Unstandardized coefficients and standardized coefficients testing direct and indirect effects for the initial just-identified model

Direct effects	*b*	*SE*	β	Two-tailed *p*-value
Cognitive rigidity → EDE-Q global	.039	.009	.294	<.001
Attention to detail→ EDE-Q global	−.006	.011	−.044	.572
Externally oriented thinking → EDE-Q global	−.005	.014	−.018	.698
Difficultly identifying feelings → EDE-Q global	.034	.014	.163	.013
Difficultly describing feelings → EDE-Q global	.022	.018	.073	.219
Cognitive rigidity → externally oriented thinking	−.067	.036	−.147	.065
Attention to detail→ externally oriented thinking	.153	.038	.320	<.001
Cognitive rigidity → difficultly identifying feelings	.198	.043	.317	<.001
Attention to detail→ difficultly identifying feelings	.195	.48	.299	<.001
Cognitive rigidity → difficultly describing feelings	.043	.032	.098	.185
Attention to detail→ difficultly describing feelings	.167	.048	.369	<.001
Indirect effects			**β**	**95% CI**
Cognitive rigidity → externally oriented thinking → EDE-Q global			.003	[−.001, .004]
Attention to detail→ externally oriented thinking → EDE-Q global			−.006	[−.006, .003]
Cognitive rigidity → difficultly describing feelings → EDE-Q global			.007	[.000, .005]
Attention to detail → difficultly describing feelings → EDE-Q global			.027	[−.002, .011]
Cognitive rigidity → difficultly identifying feelings → EDE-Q global			.052	[.002, .015]
Attention to detail→ difficultly identifying feelings → EDE-Q global			.049	[.002, .015]

Abbreviations: *b*, unstandardized beta weight; *SE*, standard error; β, standardized beta weight; 95% CI, 95% bootstrapped confidence interval for indirect effect.

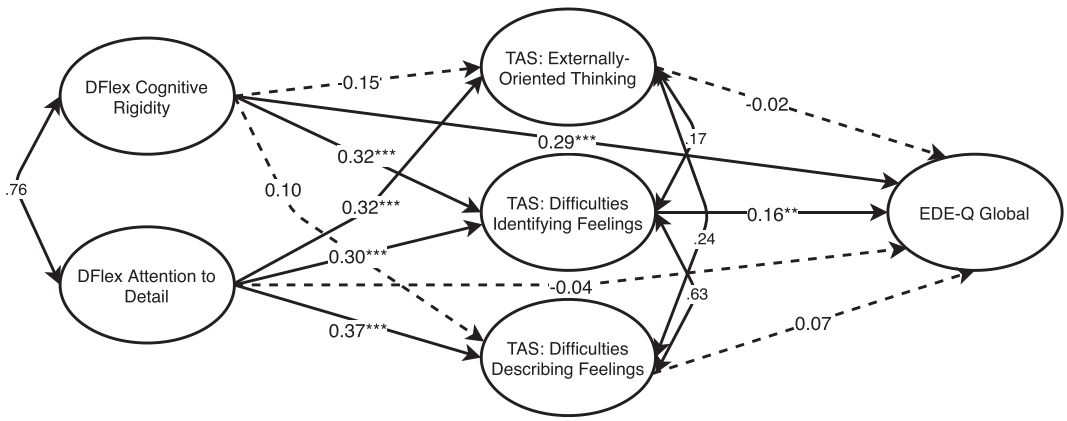

FIGURE 2 Obtained model standardized regression coefficients for the just-identified model. DFlex, Detail and Flexibility Questionnaire; TAS, Toronto Alexithymia Scale; EDE-Q global, Eating Disorder Examination Questionnaire global subscale. *$p < .05$; **$p < .01$; ***$p < .001$

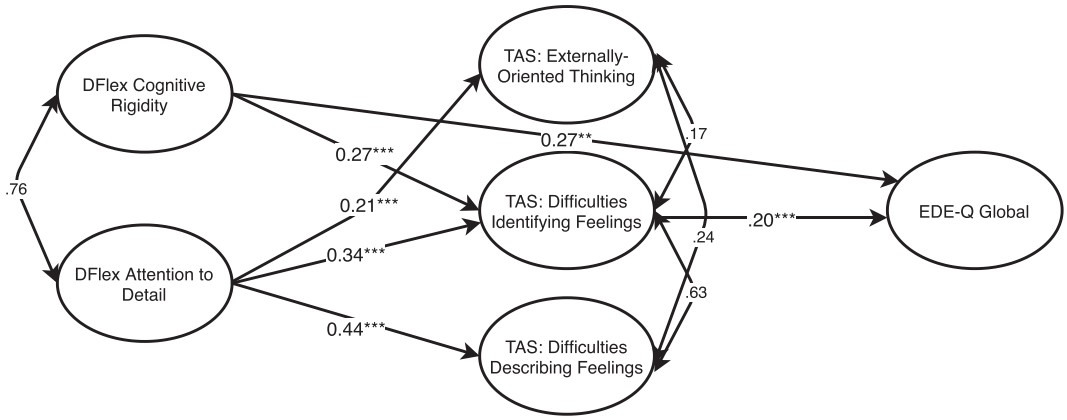

FIGURE 3 The revised parsimonious model with standardized regression coefficients presented. DFlex, Detail and Flexibility Questionnaire; TAS, Toronto Alexithymia Scale; EDE-Q global, Eating Disorder Examination Questionnaire global subscale. *$p < .05$; **$p < .01$; ***$p < .001$

identifying feelings were nonsignificant after controlling for anxiety and depression symptoms. These findings are described in further detail below.

4.1 | The relationship between attention to detail, cognitive rigidity, and alexithymia

The results of the path analyses demonstrated that higher levels of attention to detail predicted greater difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking. However, higher levels of cognitive rigidity only predicted greater difficulty identifying feelings. This is clinically significant as to our knowledge, no studies have examined the cognitive style described in the cognitive-interpersonal model and its relationship to the socioemotional traits implicated in the maintenance of EDs, such as alexithymia (Treasure & Schmidt, 2013). It is unclear why cognitive rigidity was unrelated to difficulties describing feelings or externally oriented thinking. Cognitive rigidity may be only related to an individual's capacity to differentiate between feelings and bodily sensations (e.g., "I am often confused about what emotion I am feeling"), rather than difficulties communicating feelings or focusing on the external world (Nowakowski, McFarlane, & Cassin, 2013). Cognitive rigidity in part reflects a tendency to make concrete interpretations and be inflexible regarding such interpretations, which may subsequently undermine an individual's capacity to hypothesize about and identify internal states. This may help to explain our findings; however, further research is needed to substantiate the proposed relationships.

4.2 | The relationship between attention to detail, cognitive rigidity, alexithymia and ED symptoms

The finding that only cognitive rigidity, but not attention to detail, was directly related to ED symptoms in the path analyses is not consistent with the previous clinical ED literature (Lang et al., 2014). Considerable research supports the view that both cognitive rigidity and attention to detail are prominent features within ED populations (Lang, Roberts, et al., 2016; Tchanturia et al., 2012). Interestingly, in our correlation analyses, but not the path analysis, there was a significant relationship between attention to detail and ED symptoms. These findings are consistent with Lang et al. (2014) meta-analysis that reported superior detail processing in ED populations as measured by the Group Embedded Figures Task (Witkin, Oltman, Raskin, & Karp, 1971). However, these results may suggest that the relationship between attention to detail and ED symptoms may change once other factors are taken into consideration. The use of a nonclinical ED sample in this study may also explain the lack of significant relationship between attention to detail and ED symptoms.

Further, evidence suggests that the degree of attention to detail, cognitive rigidity, and socioemotional difficulty is related to the severity of ED presentation. Harrison et al. (2012) investigated whether a particular cognitive or socioemotional profile was associated with a more severe and chronic form of illness in a sample of 100 female participants with EDs. Results from the principal components analysis showed that those with high levels of cognitive difficulties (characterized by detail focus, global integration difficulties, and cognitive

rigidity) and socioemotional difficulties (characterized by deficits in theory of mind and attentional bias for social cues) had more severe and chronic ED presentations. These findings suggest that the degree of attention to detail, cognitive rigidity, and socioemotional difficulty may strongly contribute to the maintenance of the ED.

The results of the path analysis demonstrated that difficulty identifying feelings was the only alexithymia trait that predicted ED symptoms. This is partly consistent with the previous findings in clinical (Westwood, Kerr-Gaffney, et al., 2017) and nonclinical ED populations (Alpaslan et al., 2015; De Berardis et al., 2007; De Berardis et al., 2009), which typically report no significant relationships between externally oriented thinking and ED symptoms. However, after controlling for anxiety and depression symptoms, the relationship between difficulty identifying feelings and ED symptoms became nonsignificant. These findings may indicate, as past authors have argued, that the TAS-20 assesses aspects of depression or that depression and alexithymia are distinct but highly correlated constructs (Taylor & Bagby, 2004).

Previous studies have reported significant associations between difficulties describing feelings and ED symptoms, which was not supported by our results (Westwood, Kerr-Gaffney, et al., 2017). Possible explanations for this null finding may be that previous research, which demonstrated larger effect sizes for the TAS-difficulty describing feelings subscale, utilized an AN sample, whereas this study used a nonclinical sample (Westwood, Kerr-Gaffney, et al., 2017). Therefore, the null findings in this study may be attributed to the nonclinical population.

4.3 | The indirect effects of alexithymia traits on ED symptoms

Our study is the first to demonstrate that difficulties identifying feelings, but not difficulties describing feelings or externally oriented thinking, mediated the relationship between attention to detail, cognitive rigidity, and ED symptoms. These findings are consistent with the cognitive-interpersonal model and suggest that improving the interpretation of interoceptive signals such as hunger and satiety, or learning to differentiate bodily sensations from emotions, may decrease ED symptoms in individuals who report high levels of attention to detail and cognitive rigidity (Treasure & Schmidt, 2013).

Additionally, a particularly interesting finding was that there was no significant direct relationship between attention to detail and ED symptoms, but there was a significant indirect effect of attention to detail via difficulties identifying feelings to ED symptoms. This is notable as it indicates that the excessive focus on detail, which often results in perfectionistic tendencies, only confers risk to ED symptoms when coupled with difficulties identifying internal states. It should be noted that as with the other direct effects, these significant indirect effects became nonsignificant once anxiety and depression were controlled. This suggests that the relationship between alexithymia and ED symptoms is heavily influenced by the contribution of co-occurring anxiety and depression symptoms.

Given that our study is the first to examine the direct and indirect effects of this cognitive style on ED symptoms, future studies are required to replicate our findings. In addition, given the significance of the role of anxiety and depression symptoms, these factors may be better represented in future studies as additional mediating variables in the relationship between cognitive style, alexithymia, and ED symptoms.

4.4 | Limitations of the current study

The findings of the current study should be appraised in the context of several limitations. First, the current sample has underrepresented those individuals at a clinical level of ED symptomatology, and we did not enquire whether participants had a current or past ED, hence limiting the extent to which we can generalize the current findings across the continuum of ED symptomatology. Second, the use of self-report measures may increase the risk of social desirability in responses. Furthermore, self-report may not be the most accurate assessment method for constructs such as cognitive style or alexithymia traits that require insight and self-reflection into these processes, thus influencing the results. Our sample was confined to females; therefore, the current findings may not necessarily generalize to males. This is important as research has found that aspects of alexithymia, such as externally oriented thinking and difficulties identifying feelings, are more prevalent in males compare with females with binge eating symptomology (Larsen, van Strien, Eisinga, & Engels, 2006). Therefore, the possibility remains that gender-specific pathways may exist in the relationship between alexithymia and ED symptoms.

As outlined earlier, the TAS-20 has been criticized for its potential overlap with aspects of negative affect (Luminet et al., 2001). However, we chose to use the TAS-20, as it is the most widely used measure of alexithymia, allowing us to make comparisons between the current findings and past research. Measures such as the Toronto Structured Interview for Alexithymia (Bagby, Taylor, Parker, & Dickens, 2006) allow clinicians to assess the extent of an individual's difficulties with identifying and

describing feelings, fantasy, and imaginal processes and may be better placed to examine alexithymia. One study (Balottin, Nacinovich, Bomba, & Mannarini, 2014) demonstrated that this measure was more sensitive than the TAS-20 in assessing alexithymia in women with AN. Another self-report measure for alexithymia is the Bermond-Vorst Alexithymia Questionnaire (Vorst & Bermond, 2001), which assesses cognitive aspects of alexithymia analogous to the TAS subscales, as well as two factors that assess affective aspects of alexithymia (i.e., reduced fantasizing and reduced experiencing of emotions). Because of the multifaceted nature of alexithymia, future studies utilizing multimethod approaches may be better placed to clarify the complex relationship between alexithymia traits and EDs.

In our path analysis model, we examined the EDE-Q global score rather than specific ED symptoms (e.g., dietary restraint and weight concerns). This was due to the lack of replication for the original four-factor structure for the EDE-Q and to maximize model parsimony (Allen et al., 2011). Future studies using larger samples and other ED measures such as the Eating Disorder Inventory-3 (Garner, 2004) or the Eating Pathology Symptoms Inventory (Forbush et al., 2013) may be better placed to elucidate whether specific ED symptoms are associated with cognitive style and alexithymia traits.

4.5 | Clinical implications

Withstanding these limitations, this study has numerous strengths including our assessment of the direct and indirect relationships between cognitive style, alexithymia traits, and ED symptoms in a large sample. The present findings underscore the significance of targeting difficulties identifying feelings for individuals who endorse high levels of attention to detail and cognitive rigidity. Therapies that specifically target rigidity and detail focus, such as Cognitive Remediation and Emotion Skills Training have shown to be effective in addressing cognitive rigidity and detail focus and enhancing the ability to label emotions for individuals with AN (Tchanturia, Doris, Mountford, & Fleming, 2015). Moreover, the current findings demonstrate the significant role of comorbid anxiety and depression symptoms, which reinforces the importance of the assessment and treatment of comorbid psychopathology in ED treatment.

5 | CONCLUSIONS

To conclude, the current study demonstrated that difficulties identifying feelings, but not difficulties describing feelings or externally oriented thinking, mediated the relationship between attention to detail, cognitive rigidity, and ED symptoms. Additionally, the nonsignificant direct effect but the significant indirect effect from attention to detail to ED symptoms may indicate that an excessive focus on detail only confers risk to ED symptoms when coupled with difficulties identifying feelings. However, it must be acknowledged that these mediation effects became nonsignificant once anxiety and depression were controlled for. Thus, difficulties identifying feelings may in part underlie the relationship between attention to detail and cognitive rigidity and ED symptoms, but this relationship is highly influenced by anxiety and depression symptoms. Future studies that assess anxiety and depression symptoms systematically and use more sensitive measures to examine alexithymia may better explicate the relationship between cognitive style, alexithymia traits, and ED.

Conflict of interest

The authors have no conflicts of interest to declare.

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