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Marshall, T. E., Thomas, K. S. ORCID: <https://orcid.org/0000-0002-7584-2881>, Weinstein, N. ORCID: <https://orcid.org/0000-0003-2200-6617> and Vanderwert, R. E. ORCID: <https://orcid.org/0000-0002-2280-8401> (2022) Disordered eating behaviours and basic psychological need satisfaction: the mediating role of anxiety symptoms in preadolescents. *Journal of Child & Adolescent Mental Health*, 34 (1-3). pp. 42-52. ISSN 1728-0591 doi: <https://doi.org/10.2989/17280583.2023.2277763> Available at <https://centaur.reading.ac.uk/115904/>

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To link to this article DOI: <http://dx.doi.org/10.2989/17280583.2023.2277763>

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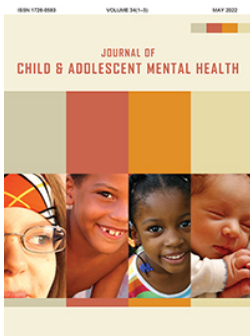
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To cite this article: Tess E Marshall, Kai S Thomas, Netta Weinstein & Ross E Vanderwert (2022) Disordered eating behaviours and basic psychological need satisfaction: the mediating role of anxiety symptoms in preadolescents, *Journal of Child & Adolescent Mental Health*, 34:1-3, 42-52, DOI: [10.2989/17280583.2023.2277763](https://doi.org/10.2989/17280583.2023.2277763)

To link to this article: <https://doi.org/10.2989/17280583.2023.2277763>



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Disordered eating behaviours and basic psychological need satisfaction: the mediating role of anxiety symptoms in preadolescents

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Objective: According to self-determination theory, satisfied basic psychological needs can be a protective factor for psychopathology, including eating disorders and anxiety symptomatology. However, most research has focused on adolescent and adult populations, with less work examining perceived basic psychological need satisfaction from parents in younger samples who report anxiety and disordered eating. This cross-sectional study aimed to investigate whether basic psychological need satisfaction from parents was associated with disordered eating in preadolescents and whether anxiety mediated this relation.

Method: A total of 211 preadolescents were recruited from primary schools across south Wales (mean age = 10.27 years, age range = 9–11 years; 49.3% female). Children completed self-report questionnaires on their basic psychological need satisfaction when with parents, as well as disordered eating and anxiety symptoms.

Results: It was found that higher needs satisfaction was associated with lower disordered eating and anxiety, with stronger relations found in girls compared with boys. Furthermore, anxiety was found to mediate this relationship.

Conclusions: Results suggest that basic psychological needs satisfaction may play an important role in the early emergence of co-occurring disordered eating and anxiety symptoms in boys and girls. The importance of considering anxiety symptoms in future work investigating needs satisfaction in the context of disordered eating and eating disorders is discussed.

Keywords: anxiety, disordered eating, eating disorders, preadolescence, self-determination theory

Supplementary information is available online at <https://doi.org/10.2989/17280583.2023.2277763>

Introduction

Eating disorders are severe psychiatric illnesses, associated with impairments in cognitive, emotional, and social functioning (Steinhausen, 2002). Importantly, eating disorders have the highest mortality rate of any psychiatric illness (Smink et al., 2012). Age-standardised annual incidence rates of all diagnosed eating disorders in the UK were 37.2 per 100 000 in 2009, with the highest incidence found in older adolescent girls and early adolescent boys (Micali et al., 2013). However, there is evidence that these diagnoses increasingly occur at earlier developmental periods (Nicholls et al., 2011; Petkova et al., 2019; Reas & Rø, 2018). Disordered eating (DE), defined as behaviours and attitudes that are present in eating disorders but not severe or frequent enough to meet eating disorder diagnostic criteria (Graber et al., 1994), are found to be common in the general population (Naor-Ziv & Glicksohn, 2016) and can emerge in late childhood (Breton

et al., 2022). Further, DE in childhood is found to increase the risk of developing a diagnosable eating disorder in adolescence (Evans et al., 2017; Herle et al., 2020). This highlights the need for research to start at earlier developmental periods to identify antecedents of eating disorders and capture risk trajectories.

The co-occurrence of anxiety and eating disorders has been well established in the literature (Halmi et al., 1991; Keel et al., 2005) and extends to overlapping DE and anxiety symptoms in subclinical adolescents (Touchette et al., 2011) and preadolescents (Thomas et al., 2021). Research has found individuals with eating disorders and co-occurring anxiety are more likely to have persisting eating disorder symptoms and poorer outcomes than those without co-occurring diagnoses (Hjern et al., 2006; Milos et al., 2002). Further, anxiety tends to precede the development of eating disorders (Bulik et al., 1997; Godart et al., 2000) and could therefore confer risk for developing DE, making anxiety important in investigations into the aetiology of DE and possible correlates.

Research on the development of both anxiety and DE has been framed using self-determination theory (Deci & Ryan, 2008b; Ryan & Deci, 2000, 2017). Self-determination theory describes three basic psychological needs for establishing and maintaining optimal functioning. These are *autonomy*, the perception that one's behaviour is volitional rather than controlled by the environment; *competence*, one feels capable when interacting with the environment; and *relatedness*, a sense of closeness and belonging to others (Deci & Ryan, 2008a). These needs can be satisfied through supportive interpersonal relationships and, when fulfilled, healthy development is promoted (Deci & Ryan, 2000, 2008b; Patrick et al., 2007). Therefore, the social environment can play an important role in the satisfaction of basic psychological needs. In research examining basic psychological needs satisfaction (hereafter referred to as need satisfaction) in children, parents are seen as the primary socialising agents (van der Kaap-Deeder et al., 2017), while the influence of peers has been highlighted in adolescence (Ratelle et al., 2013). Most prior research in children has focused solely on autonomy support provided by parents (e.g., Grolnick et al., 2007; Williams et al., 2000), rather than expanding this examination to include satisfaction of competence and relatedness when with parents.

In various contexts, need satisfaction has been associated with lower anxiety (Baard et al., 2000; Weinstein et al., 2016; Weinstein & Stone, 2018), suggesting that need satisfaction plays an important role in well-being. In children and adolescents, insufficient need satisfaction when with parents has been linked with poor psychosocial adjustment and increased anxiety (Barber et al., 1994; Grolnick et al., 2000; Kearns, 2017). In addition, need satisfaction has been negatively associated with DE in adult women (Bégin et al., 2018) and adolescent girls (Thøgersen-Ntoumani et al., 2010). In adults, this finding has been extended to males. For example, higher levels of need satisfaction were associated with lower levels of DE in young adults, which was correlated with lower levels of body dissatisfaction and unhealthy weight control behaviours (Hricova et al., 2016, 2020). Although cross-sectional in nature, this suggests need satisfaction may play a protective role in the development of DE in male and female adults. However, previous research has not examined this in younger samples, which would be important to establish before conducting more costly longitudinal studies to probe causality.

According to self-determination theory, individuals adopt compensatory strategies to cope with underlying need deficiencies (Ryan et al., 2016). For example, women with an established eating disorder report low levels of control in their lives (Dalglish et al., 2001). This can lead to individuals engaging in rigid or rule-based eating behaviours (e.g., restriction of calories or inflexible eating rituals) to establish control and manage negative emotions (Lawrence, 1979; Troop et al., 1998). Taken together, these findings suggest need satisfaction may play a key role in the co-occurrence of anxiety and DE behaviours. For example, fulfilment of basic psychological needs may lead to lower levels of anxiety, which, in turn, may result in less engagement in maladaptive coping strategies, such as DE.

The current study aimed to address the dearth of knowledge surrounding the relation between need satisfaction and DE, as well as the mediating role of anxiety, in a sample of preadolescent boys and girls. As interactions with parents are particularly important for need fulfilment and well-being compared with other socialisation figures in younger samples (van der Kaap-Deeder et al., 2017), the current study examined children's perception of need satisfaction by their parents. The current

study has two hypotheses: (1) higher self-reported need satisfaction is associated with lower levels of DE and anxiety; and (2) anxiety will indirectly link the relation between need satisfaction and DE. That is, higher need satisfaction will be associated with lower anxiety, which, in turn, will be associated with less DE. Because the current study was cross-sectional, additional analyses were conducted to explore bidirectional processes that might be present. It was important to consider an alternative hypothesis, that need satisfaction will account for the relation between anxiety and DE.

Method

Participants

We recruited 211 children from 12 state-run primary schools in south Wales (Mean age = 10.27 years, SD = 0.57, range = 9–11 years; 49.3% female). Further demographic information was not collected at the individual/family level; however, individual school characteristics were collated from a Welsh Government school information database (Welsh Government, n.d.). For example, free school meal uptake, used as an index of material deprivation, ranged from 2.0% to 50.4% across the 12 schools, with an average of 25.9%. This is above the Welsh average of 18% (Welsh Government, 2019). In addition, the proportion of children who were learning English as an additional language ranged from 1.3% to 25.5% ($M = 10.5\%$), while between 5.9% and 35.8% of children were reported to have additional learning needs ($M = 22.8\%$). Full details of school recruitment and individual school characteristics are provided in Thomas et al. (2021). Two children were excluded due to non-completion of one of the three questionnaire measures, meaning the final sample contained 209 children.

Headteachers of the participating schools provided gatekeeper consent before parents/guardians were sent information concerning the study. Parents/guardians were required to respond to the school with opt-in written consent before their child was invited to participate in the study. These children were asked to provide written assent before participating. Both parent/guardian and child received a description of the study, were given the opportunity to ask questions, and were made aware of their right to withdraw at any stage of the study. Ethical approval (EC.19.02.12.5566GR3A3) was received from the Cardiff University School of Psychology Ethics Committee. All data were stored anonymously. Research was conducted in accordance with British Psychological Society guidelines and the Economic and Social Research Council Research Ethics Framework.

Procedure

Questionnaires were administered during class time, lasting approximately 20 minutes. Children were tested in small groups under the supervision of two researchers. Children who did not consent remained in their regular lesson in a separate classroom with their teacher. Children were given verbal and age-appropriate written instructions and the opportunity to ask questions throughout the session. Children were verbally debriefed at the end of the study while parents/guardians were given a written debrief and contact details for support organisations and resources.

Materials

Basic Psychological Needs Scale

The Basic Psychological Needs Scale (La Guardia et al., 2000) was used to assess satisfaction with the three basic psychological needs: Autonomy (“I feel I can be who I am”); Competence (“I feel like a competent person”); and Relatedness (“I feel loved and cared about”). This scale was used with children in previous research (Weinstein et al., 2021). Children indicate how true each statement is of their relationship with the caregiver with whom they spend the most time using a 7-point Likert-type scale ranging from (1) Not at all true, and (4) Somewhat true, to (7) Very true. The scale involved nine items, with three items per subscale. However, only total score was used to measure need satisfaction in this study. Higher scores indicate higher satisfaction of needs (maximum score = 21). In the current study, $\alpha = 0.74$ was observed for the full sample, $\alpha = 0.73$ for girls, and $\alpha = 0.69$ for boys.

Revised Child Anxiety and Depression Scale 25-item version (RCADS-25)

The Anxiety subscale within RCADS-25 (Muris et al., 2002) was used. Items were rated on a 4-point scale (0 = Never, 1 = Sometimes, 2 = Often, 3 = Always), and represent the frequency of anxiety-related behaviours, thoughts, or feelings, (e.g., “I worry that something bad will happen to me”). Higher scores indicate more severe anxiety symptomatology (maximum = 45). The anxiety subscale was used in this study, which has high test–retest reliability ($r_s = 0.78–0.86$, $p < 0.001$) and internal consistency ($\alpha = 0.87–0.95$; Brown et al., 2014). In the current study, $\alpha = 0.86$ was observed for the full sample, $\alpha = 0.88$ for girls, and $\alpha = 0.84$ for boys.

Children’s Disordered Eating Attitudes Test (ChEAT)

DE behaviours and attitudes were measured using the ChEAT (Maloney et al., 1988), a self-report questionnaire with 26 items designed to measure food preoccupation, dieting behaviours, and weight concerns in children aged between 8 and 13 years old. Its 6-point Likert scale (always, very often, often, sometimes, rarely, never) represents the frequency with which the child demonstrates the attitude or behaviour described in each item (e.g., “I like my stomach to be empty”). The total ChEAT score was used in this study. Scores range from 0–78, with the three most symptomatic responses (often, very often, and always) scored from 1–3 respectively, and the remaining three responses scored as zero. Higher scores on the ChEAT indicate higher levels of DE symptomatology. The scale showed good test–retest reliability ($\alpha = 0.81$) and internal consistency ($\alpha = 0.90$), and moderate concurrent validity in boys and girls (Maloney et al., 1988; Smolak & Levine, 1994). $\alpha = 0.71$ was observed for the full sample in the current study, with $\alpha = 0.74$ for girls, and $\alpha = 0.68$ for boys.

Data analysis

Analyses were conducted using SPSS v. 25 (IBM Corp, Armonk NY, USA). Skewness and kurtosis were examined (Skewness: Basic Psychological Need Scale = -1.123 ; ChEAT = 1.544 ; RCADS Anxiety = 0.974 . Kurtosis: Basic Psychological Need Scale = 1.614 ; ChEAT = 3.435 ; RCADS Anxiety = 0.590). Shapiro–Wilk normality tests were significant for all four variables indicating a non-normal distribution (ChEAT: $W(209) = 0.880$, $p < 0.001$; RCADS Anxiety: $W(209) = 0.929$, $p < 0.001$; Basic Psychological Need Scale: $W(209) = 0.926$, $p < 0.001$). Log transformation was performed on non-normal variables. No differences in overall significance or effect sizes were found between transformed and original data. Therefore, we report analyses from the original data for simplicity. Linearity was assessed by partial regression plots and a plot of studentised residuals against the predicted values, along with homoscedasticity. There were 33 data points missing from the ChEAT data (0.6%), 14 data points missing from the RCADS data (0.4%), and 13 data points missing from the Basic Psychological Need Scale data (0.7%). These missing values were inspected and, based on results of the Little’s MCAR test: $\chi^2(1684, N = 209) = 1750.11$, $p = 0.128$, determined to be missing completely at random.

Sex differences were examined and, where appropriate, sex was added as a covariate to additional analyses. We selected to control statistically for sex as a covariate rather than consider it as a moderator for two reasons. The first is that the current study is not sufficiently powered for conducting moderation analyses. Alongside this analytic reason, research in preadolescents rarely identifies gender/sex differences in DE (Holm-Denoma et al., 2014; Thomas et al., 2021) and we had no theoretical reason to believe that the relations among traits measured would be different for males and females.

Correlational analyses were used to examine whether need satisfaction (Basic Psychological Need Scale score) was associated with DE (ChEAT score) and anxiety (RCADS Anxiety). To conduct mediation analysis, we tested total, direct, and indirect effects using a percentile bootstrap estimation approach with 10 000 samples (Shrout & Bolger, 2002), implemented with the PROCESS macroVersion 3.5 (Hayes, 2017). Using PROCESS Model 4, we performed two mediation analyses to analyse: (1) the relations between need satisfaction (X) and DE (Y) through anxiety (M), and (2) the relations between anxiety (X) and DE (Y) through need satisfaction (M). An alpha level of 0.05 was used as a benchmark for statistical significance for all analyses. Post-hoc analyses were conducted to examine effects within girls (see Supplementary Figures S1 and S3) and boys (Figures S2 and S4) separately.

Results

Table 1 presents descriptive statistics for each measure. Females had significantly higher need satisfaction compared with males. Participants' age was not significantly associated with any of the four study variables (ChEAT: $r = 0.094$; RCADS Anxiety: $r = 0.060$; Basic Psychological Need Scale: $r = 0.080$, all p -values > 0.10).

To test our first hypothesis, Pearson correlations were conducted to examine the associations between questionnaire measures split by sex (Table 2). There was a strong positive correlation between anxiety and DE for both males and females. Negative correlations between need satisfaction and both DE and anxiety were significant. Correlations were stronger for females; therefore, sex was added as a covariate to subsequent analyses.

To investigate these relations further, a mediational analysis was performed. Anxiety was found to mediate the relation between need satisfaction and DE. Higher need satisfaction was associated with lower anxiety, and lower anxiety was associated with lower DE. Need satisfaction no longer predicted DE after controlling for anxiety (Figure 1). Approximately 3% of the variance in DE was accounted for by the study variables ($R^2 = 0.292$), a small effect size (Cohen, 1988). The total effect was negative and significant, $b = -0.853$, $SE = 0.169$, 95% CI $[-1.185, -0.521]$, the direct effect was negative and non-significant, $b = -0.237$, $SE = 0.174$, 95% CI $[-0.579, 0.106]$, and the indirect coefficient was negative and significant, $b = -0.616$, $SE = 0.174$, 95% CI $[-1.032, -0.304]$. Complete parameter estimates are presented in Supplementary Table S1.

Exploratory analyses examined whether need satisfaction would mediate the relation between anxiety and DE, indicative of bidirectional processes between need satisfaction and anxiety, resulting in DE (Figure 2). Lower anxiety predicted higher need satisfaction, whilst need satisfaction did not predict DE. However, anxiety remained a significant predictor of DE, inconsistent with the mediational hypothesis. Bootstrapped estimation in PROCESS indicated the total and direct effects were significant, $b = 0.458$, $SE = 0.051$, 95% CI $[0.358, 0.558]$, and $b = 0.419$, $SE = 0.058$, 95% CI $[0.304, 0.534]$ respectively, and the unstandardised indirect coefficient was negative and non-significant, $b = 0.039$, $SE = 0.036$, 95% CI $[-0.035, 0.105]$. Complete parameter estimates are presented in Supplementary Table S2.

Table 1: Descriptive statistics of questionnaire measures, split by sex

	Whole sample (<i>N</i> = 209)		Male (<i>n</i> = 106)		Female (<i>n</i> = 103)		<i>F</i> (1, 207)	<i>p</i>
	<i>M</i> (SD)	Min–Max	<i>M</i> (SD)	Min–Max	<i>M</i> (SD)	Min–Max		
Disordered eating	9.11 (6.79)	0–43	9.46 (6.79)	0–31	8.74 (6.81)	0–43	0.593	0.442
Anxiety	12.66 (7.91)	0–38	11.98 (7.14)	1–29	13.35 (8.61)	0–38	1.567	0.212
Needs	17.18 (2.67)	6.67–21	16.82 (2.69)	7–21	17.55 (2.61)	6.67–21	3.952	0.048

Needs = Basic Psychological Needs Satisfaction; SD = standard deviation

Table 2: Pearson correlations for main study variables, split by gender

Sex		Disordered eating	Anxiety
Female	Anxiety	0.639**	
	Needs	-0.364**	-0.621**
Male	Anxiety	0.412**	
	Needs	-0.303*	-0.355**

Needs = Basic Psychological Needs Satisfaction

* $p < 0.003$, ** $p < 0.001$

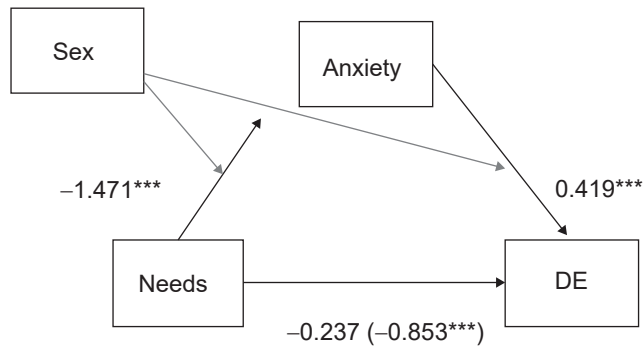


Figure 1: Mediation model of anxiety effects on the relation between basic psychological needs satisfaction (needs) and disordered eating (DE) with sex as a covariate (** $p < 0.001$)

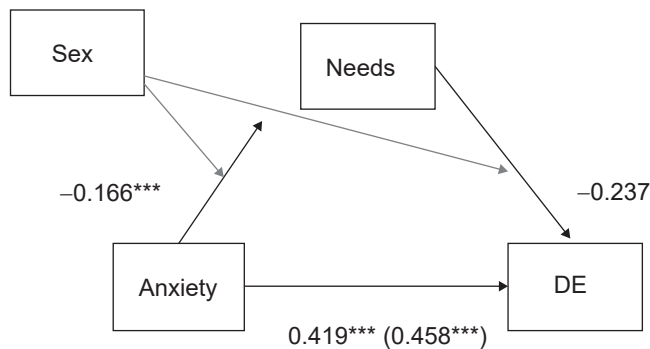


Figure 2: Mediation model of basic psychological needs satisfaction (needs) effects on the relation between anxiety and disordered eating (DE) with sex as a covariate (** $p < 0.001$)

Discussion

This study aimed to investigate the association between need satisfaction from parents and DE in children, adding to the limited literature investigating this relation. Children who reported higher need satisfaction reported lower levels of DE compared with children who reported lower need satisfaction. This is consistent with work in adolescents (Depestele et al., 2017; Kopp & Zimmer-Gembeck, 2011) and self-determination theory's assertion that needs satisfaction disturbances play a role in eating disorder development (Ryan et al., 2016). This emphasises the importance of need satisfaction in children's well-being and development.

When controlling for participants' anxiety, need satisfaction was no longer associated with DE. This is consistent with literature across the lifespan suggesting robust associations between higher need satisfaction and lower anxiety. Therefore, it is reasonable that anxiety may mediate the association between DE and need satisfaction. Thus, anxiety offers a potential explanation for why need satisfaction may be an important protective factor against eating disorder development.

Self-determination theory proposes that individuals engage in DE to compensate for basic psychological need deficiencies (Deci & Ryan, 2000; Verstuyf et al., 2012). Our findings instead suggest that higher need satisfaction is related to lower levels of anxiety, which is associated with lower levels of DE behaviours. This introduces the idea that DE may be a by-product of core

psychological difficulties, like dealing with negative affect and distress in maladaptive ways. For example, anxiety may be induced by insufficient need satisfaction and as individuals lack adaptive ways to deal with anxiety, they subsequently engage in DE behaviours to reduce distress. This is consistent with research reporting that lower need satisfaction is associated with poor emotion regulation (Brenning et al., 2015; Roth & Assor, 2012), which is a well-documented factor present in eating disorder populations (Gianini et al., 2013). Indeed, reports from eating disorder samples suggest DE behaviours are used to manage negative emotional experiences (Kaye et al., 1986; Nordbø et al., 2006). Future work should examine emotion regulation in conjunction with perceived need satisfaction and DE behaviours, and/or include a qualitative component to explore children's appraisals in a stressful situation (i.e., Do they perceive control over the event? And do they feel efficacious in managing the problem?).

Given the cross-sectional design, we also examined whether greater need satisfaction was associated with lower levels of anxiety, and whether this would, in turn, be associated with lower levels of DE. Although anxiety was significantly associated with DE, need satisfaction did not mediate the relation. These findings failed to support a model of bidirectional processes between need satisfaction and anxiety in the context of DE. Instead, evidence suggested greater need satisfaction was associated with lower levels of anxiety, which, in turn, was related to lower levels of DE. However, longitudinal studies will be required to assess any causal processes.

Strengths of the study

Given the demonstrated link between DE in childhood and increased risk of developing a diagnosed eating disorder in adolescence (Evans et al., 2017; Herle et al., 2020), a strength of the current study is its focus on an earlier developmental period (i.e., children). In addition, recruitment from schools located in diverse communities provided a more representative sample compared with recruitment from one area only. Consideration of anxiety symptoms strengthens the clinical utility of the current study, particularly due to the high co-occurrence of diagnosed anxiety and eating disorders. A final strength of the current study is the inclusion of both male and female preadolescents. Although the majority of eating disorder research in older samples studies females only, research with younger samples highlights the lack of sex differences in reported DE (Holm-Denoma et al., 2014; Thomas et al., 2021). Our broader recruitment contributes to the current shortage of literature assessing the relation between basic psychological need satisfaction and DE in children, which is not limited to those who identify as female.

Limitations and future directions

The current study examined only children's self-reported satisfaction of basic psychological needs by their parents. Measurement of parental behaviours, such as through parent self-report or coded observations of parent-child interactions, would strengthen the current study. Studies conducted with children have specifically highlighted the positive impact of autonomy-supportive parent-child interactions on children's well-being through perceived need satisfaction (Costa et al., 2016); as well as the detrimental impact psychologically controlling parenting can have on well-being through a lack of need satisfaction (Barber et al., 1994; Grolnick et al., 2000). Given the importance of parental processes in children's need satisfaction, the current study would have benefited from the examination of parental behaviours in addition to child self-report.

Research has indicated that autonomy disturbances are particularly implicated in psychopathology risk (Depestele et al., 2017; Ryan et al., 2016). Although the measure used in the current study enabled the authors to calculate an autonomy subscale, the reliability of this measure in the current sample was insufficient to trust its measurement accuracy. Future investigation into the relation between DE, anxiety, and autonomy satisfaction specifically, is encouraged.

Due to the cross-sectional design of the current study, causality of the observed effects was difficult to determine, and longitudinal outcomes of participants were not captured. Future studies tracking child and adolescent trajectories will allow for a greater understanding of the mechanisms

that confer eating disorder risk, as well as protect against eating disorder development. Longitudinal methods would also allow investigations into the temporal sequencing of causal processes and bidirectional effects. It is imperative that more research efforts are directed towards understanding the causal risk and resilience factors in DE, to improve outcomes for children.

Implications

Our findings have several implications for clinical practice and parenting interventions. First, our findings suggest that lower levels of anxiety are related to lower levels of DE in both boys and girls during preadolescence, suggesting prevention and interventions must target both co-occurring DE and anxiety symptoms across all children. In support of this, eating disorder treatments that target levels of anxiety, such as meditation or cognitive behavioural therapy, have proven efficacious in alleviating eating disorder symptoms (Kristeller & Hallett, 1999; Schlup et al., 2009). Second, higher BPNS and lower anxiety symptoms may serve a protective function against the development of eating disorders, as more autonomous functioning has been linked with better coping (Weinstein & Ryan, 2011). These findings have implications for prevention strategies that foster emotional regulation, teaching children to manage anxiety and cope with stressful life events in adaptive ways, as well as interventions that target parent–child processes and develop parental behaviours that support children’s basic psychological needs.

Conclusion

The present study tested a model evaluating the relationships among need satisfaction, anxiety symptoms, and DE in late childhood. Comparisons of statistical models pointed to a conceptual model wherein higher levels of need satisfaction were associated with lower levels of anxiety, which in turn was associated with lower levels of DE. This novel theoretical model is among the first to describe how need satisfaction relates to co-occurring problematic eating behaviour and anxiety in children and can inform future longitudinal and intervention work to reduce DE in childhood.

Acknowledgements — This research was supported by an Economic and Social Research Council (#1942485) doctoral training partnership studentship (awarded to KT). The authors thank the families and teachers for their participation and contribution to this project. The data that support the findings of this study are openly available in the Open Science Framework at <https://osf.io/b4x39/DOI.10.17605/OSF.IO/B4X39>

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