# Activity-related parenting practices: Development of the Parenting Related to Activity Measure (PRAM) and links with mothers' eating psychopathology and compulsive exercise beliefs

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Running header: PREDICTORS OF ACTIVITY PARENTING

Acknowledgements: We would like to thank Rebecca Allen, Jennie Norfield and Sarah Hodgson for their assistance with the data collection.

**Abstract**

This is a two-study paper which developed a measure to assess parenting practices related to children's physical activity and explored maternal predictors of such parenting practices. Study 1: A self-report measure of parents' activity-related practices (the Parenting Related to Activity Measure; PRAM) was developed and a principal component analysis was carried out using data from 233 mothers of 4.5-to-9-year-old children. The results supported a six-factor model and yielded the following subscales: Responsibility/monitoring; Activity regulation; Control of active behaviours; Overweight concern; Rewarding parenting; Pressure to exercise. Study 2: Mothers (N=170) completed the PRAM, alongside measures of eating psychopathology and compulsive exercise, to identify predictors of activity-related parenting practices. Mothers' eating psychopathology and exercise beliefs predicted activity parenting practices with their sons and daughters but different predictors were seen for mothers of daughters versus sons. Mothers' eating and exercise attitudes are important predictors of their activity-related parenting practices, particularly with girls. Identifying early interactions around activity/exercise could be important in preventing the development of problematic beliefs about exercise, which are often a key symptom of eating disorders.

**Keywords**: exercise; child; parenting; eating disorders; compulsive exercise.

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Eating disorders and exercising have been found to co-occur in both clinical (Davis, Kennedy, Ravelski, & Dionne, 1994) and non-clinical groups (Lipsey, Barton, Hulley & Hill, 2006). Given that pathological exercise attitudes and behaviours can have detrimental implications, such as co-morbid disordered eating and anxiety (e.g., Coen & Ogles, 1993; Shroff et al., 2006), trying to better understand their origins seems an important area of study. Engaging in physical activity from an early age has been linked to an increased risk for the later development of an eating disorder (e.g., Davis et al., 1994). Furthermore, there is evidence for the intergenerational transmission of problematic eating behaviours from parent to child (e.g., Patel, Wheatcroft, Park & Stein, 2002), and for the importance of early experience in the development of other forms of compulsive psychopathology (for instance, binge-eating and purging behaviours; Tereno, Soares, Martins, Celani & Sampaio, 2008; Wade, Gillespie & Martin, 2007), and so it would seem prudent to begin to explore parents' attitudes and behaviours around their children's physical activity/exercise and to examine how these parenting behaviours might be related to the parents' own disordered eating and exercise attitudes.

The nature of parent-child interaction appears to be crucial across several health domains. Early parent-child interaction has been found to be important in the development and maintenance of health-promoting behaviours (e.g., Fisher & Birch, 1999, 2002; Tinsley, 2003; Wardle, Carnell & Cooke, 2005). For example, in preschool children, parental reinforcement and modelling of healthy eating behaviour predicts healthy food choice (e.g., Brown & Ogden, 2004; Wardle et al., 2005) and child body mass index (BMI) (e.g., Lumeng & Burke, 2006). However, among the same age group, overly controlling interactions around food, particularly involving the consumption of fruits and vegetables, have been shown to be associated with children subsequently eating fewer of these foods (e.g., Fisher, Mitchell, Smiciklas-Wright & Birch, 2002; Wardle et al., 2005). Whilst overly controlling parenting

practices around child feeding (e.g., pressure to eat certain foods, the restriction of foods, and the use of foods as rewards) have been shown to impair children's internal hunger and satiety cues (e.g., Fisher & Birch, 1999, 2002), less is known about the practices parents might use when interacting with their children around physical activity. This is a significant gap in the literature given the potential impact that these early interactions around activity might have for the later development of disordered eating and problematic exercise behaviours.

The reasons behind parents' use of controlling parenting practices in various domains have been explored by various researchers. For example, Costanzo and Woody (1985) developed a theory of domain-specific parenting, which posits that parents can be more controlling in domains of parenting in which they are either highly invested themselves, or in which they perceive elements of risk for their children. Parents with higher levels of their own disordered eating- and body-related attitudes have been shown to be more controlling in interactions with their children around feeding (e.g., Blissett & Haycraft, 2011; Blissett, Meyer & Haycraft, 2006) and to be more controlling and less sensitive with their children in non-mealtime contexts (Haycraft & Blissett, 2010; Stein et al., 2001). It is thus conceivable that parents with concerns about eating, body shape and weight may implement different strategies with their children around physical activity than do parents without such concerns. In particular, it is likely that eating disordered cognitions that are specifically concerned with compulsive exercise will be particularly salient in determining parents' activity-related parenting with their children. Linking this to Costanzo and Woody's (1985) theory, it is possible that parents who themselves are highly invested in activity or exercise may be more controlling around activity behaviours with their children.

Research to date has examined parents' activity-related parenting practices with their adolescent girls (Davison, Cutting & Birch, 2003), finding higher levels of parental support for active behaviours to be associated with daughters' increased activity. Other work has explored adolescents' own reports of the influences from parents or friends on their activity (e.g., Saunders et al., 1997), with greater social influence relating to increased physical

activity. While the benefits of activity interaction have sometimes been evidenced, recent research has found parental encouragement of activity as a means of promoting weight loss in adolescent girls to have unintended consequences; namely, higher levels of girls' concern about their weight and increased BMI (Davison & Deane, 2010). Davison and Deane drew parallels between the child feeding domain and the activity domain, suggesting that overly controlling parenting practices might have unintended consequences in both arenas. Given findings which suggest that overly controlling feeding and activity-related parenting practices can link to unintended outcomes (e.g., Davison & Deane, 2010; Fisher & Birch, 1999, 2002; Fisher et al., 2002; Wardle et al., 2005), exploring this in relation to activity in younger children seems judicious. However, despite the existence of other measures looking at positive parenting strategies related to activity (e.g., Davison et al., 2003; Sallis, Grossman, Pinski, Patterson & Nader, 1987; Saunders et al., 1997), to our knowledge, there is currently no measure which considers over-controlling parenting practices relating to physical activity with younger children.

In addition, there is evidence to suggest that there may be differences in parenting behaviours and perceptions depending on parent and child gender. Mothers have been shown to be more concerned about their daughters' potential for overweight than their sons' (Agras, Hammer & McNicholas, 1999; Costanzo & Woody, 1985), and to implement different feeding strategies with their sons than with their daughters (e.g., Blissett et al., 2006; Tiggemann & Lowes, 2002). It has also been found that boys tend to receive more activity support and to be more active than girls (Gustafson & Rhodes, 2006). In view of these differences, it is likely that parents will interact differently with their sons and their daughters around activity behaviours. Although fathers' parenting roles have increased considerably, mothers still tend to be the primary caregivers and often spend more time in direct interactions with their children than fathers do (e.g., Blissett et al., 2006; McHale, Crouter, McGuire & Updegraff, 1995). As such, this study will specifically focus on mothers' activity parenting practices with their sons and daughters.

In summary, despite the importance of early parenting practices in the development of health-related behaviours, and the impact of parental mental health symptoms on parenting practices (e.g. Blissett et al., 2006; Haycraft & Blissett, 2010; Stein et al., 2001), no research has adequately measured or explored the predictors of over-controlling parenting behaviours in relation to children's physical activity. Exploring this area might provide important information about why some individuals are more at risk for developing less healthy attitudes towards exercise and eating later on in life. The aims of the current study are two-fold: first, to develop a measure to assess parenting practices related to children's physical activity and, second, to test a model of risk by determining the specific maternal predictors of such parenting practices among mothers of young boys and girls. In keeping with previous findings from the feeding and physical activity domains (e.g., Hughes, Power, Fisher, Mueller & Nicklas, 2005; Schmitz et al., 2002), it is hypothesised that a mother's attitudes towards her own exercise and eating will significantly predict the activity parenting that she reports using with her offspring. Moreover, given the established differences in the perceptions and behaviours of mothers of girls and mothers of boys (e.g., Agras et al., 1999; Gustafson & Rhodes, 2006), it is expected that the predictors of a mother's activity-related parenting will differ depending upon the gender of her child. Specifically, in keeping with the findings of Agras et al. (1999), it is expected that mothers of girls will endorse activity-related practices reflecting their greater concern about weight than mothers of boys. Conversely, based on the findings of Guftafson and Rhodes (2006), it is expected that mothers of boys will endorse practices relating to activity support.

## Study 1: Construction of the Parenting Related to Activity Measure (PRAM)

### Method

With permission from the lead author, the PRAM (see Appendix 1)[1] was created specifically for this study by adapting a pre-existing and widely used measure of parents' child feeding practices; the Child Feeding Questionnaire (CFQ; Birch et al., 2001). The CFQ

[1] Copy also available from the corresponding author on request

assesses parents' attitudes and behaviours with regard to child feeding and parents' concerns about children's obesity proneness. It is a 31-item measure with seven subscales which assess: perceived responsibility for feeding; monitoring; pressure to eat; restriction; perceived parent overweight; perceived child overweight; and, concern about child overweight. It is extensively used as a measure of parents' controlling feeding practices and for assessing parents' involvement in feeding and concerns about their child's weight. In the absence of any pre-existing measures which tap similar constructs in relation to parenting around activity, the CFQ was adapted to reflect parenting practices with regard to children's physical activity and sedentary behaviours. The CFQ subscales of perceived parent overweight and perceived child overweight (and the 10 questions which comprise them) were excluded from the creation of the PRAM as they examine perception of weight status rather than parental behaviours or concerns. The remaining 21 questions of the CFQ were re-worded to consider active and sedentary behaviours, whilst leaving the meaning and content as similar as possible to the feeding questions in the CFQ. For example, question 10 on the CFQ is "If I did not guide or regulate my child's eating, s/he would eat much less than s/he should". This was reworded for the PRAM as follows: "If I did not guide or regulate my child's physical activity, s/he would do much less than s/he should". The questions contained within the PRAM are presented in Table 1 and Appendix 1. Response options for the PRAM remained the same as those used for the CFQ: never (1) to always (5) for questions one to six; disagree (1) to agree (5) for questions seven to 18; unconcerned (1) to concerned (5) for questions 19 to 21.

*Participants*

Following institutional review board ethical clearance, 233 mothers of children aged 4.5 to 9 years (mean age 7 years, SD 1.21) were recruited via infant and junior schools in England. The schools were selected on an opportunity basis and represented a range of socio-economic groups. A sample of 11 participants per item on the PRAM ensured the extraction of reliable factors from the factor analysis (Kass & Tinsley, 1979). The mothers'

mean age was 38 years (SD 5.31; range 24 to 54 years). Their mean BMI was 24 (SD 4.45; range 17 to 58). Ninety-four percent of the mothers were the biological parent of the child they were reporting on and 89% reported their own and their child's ethnicity as White British. Twenty-eight percent of the mothers reported having up to two years of post-16 education and 32% reported three to five years of education post-16. Mothers reported a range of occupations and the modal occupation was housewife. A subset of these mothers (n = 170) also took part in study 2.

*Procedure*

After giving informed consent, the participants completed the PRAM and provided a range of demographic information about themselves and their child. Mothers reported their own and their child's heights and weights, ethnicity and age, as well as their current or most recent occupation prior to motherhood, the number of years of post-16 education they had, and their relationship to the child. Participants also completed the Activity-Related Parenting Practices Scale (ARPPS; Davison et al., 2003), a 7 item measure assessing respondents' levels of activity-related logistic support (e.g., "How active are you in enrolling your child in sports?") and activity-related explicit modelling (e.g., "How much do you use your own behaviour to encourage your child to be physically active?") with their children. Responses are made on a 4-point scale and mean scores are calculated to generate the two subscales.

## Results

*Initial factor analysis*

The data from the 233 mothers on the PRAM were analysed by means of a principal component analysis, with varimax rotation. The various indicators of factorability were fine and the residuals indicate that the solution was a good one. The KMO measure of sampling adequacy value of .713 was also good. Six components with an Eigenvalue greater than one (Kaiser, 1961) were found and were confirmed by an analysis of the Scree plot (Cattell, 1966). The six components explained 65.53% of the variance (Factor 1, variance 20.50%;

Factor 2, variance 13.46%; Factor 3, variance 12.45%; Factor 4, variance 7.27%; Factor 5, variance 6.98%; Factor 6, variance 4.87%). Eigenvalues for the six factors are presented in Table 1. These six factors were then subjected to a varimax rotation and, following this, the rotated 21-item matrix was screened for any items which loaded poorly onto a factor or which displayed overlap. Item loadings were set at >.04 (Field, 2009). No items were deemed worthy of exclusion from the rotated matrix. Items 8 and 19 loaded at >.04 onto two factors. For each of these, the items were retained within the factor where there was the best conceptual fit (factor 6 for item 8; factor 4 for item 19). All other items loaded strongly and distinctly onto one main factor.

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TABLE 1 ABOUT HERE

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*Factors*

Factor 1 (6 items) contained items concerned with parents' perceived responsibility for, and monitoring of, children's active and sedentary behaviours, and was thus labelled "Responsibility/monitoring". Factor 2 (3 items) reflected parents' guidance of children's physical and sedentary behaviours and was titled "Activity regulation". The third factor (3 items) reflected parents' concerns about their children doing too much activity and their restriction of activity behaviours and was therefore labelled "Control of active behaviours". Factor 4 (3 items) reflected parents' concerns about their child becoming overweight and the need for their child to exercise to avoid becoming overweight. It was labelled "Overweight concern". Factor 5 (3 items) contained items relating to parents' use of physical and sedentary activities as rewards, and it was therefore labelled "Rewarding parenting". The sixth factor (3 items) reflected parents' use of pressure for their children to exercise and was thus labelled "Pressure to exercise". A mean score for each subscale was calculated from the item scores within each subscale (see Appendix 1). The items and factor loadings of all the items in the PRAM are shown in Table 1.

*Internal consistency*

Cronbach's alpha tests of internal consistency indicated that the overall PRAM (21 items) achieved good reliability (α = 0.78). Alpha coefficients for each of the six PRAM subscales ranged from 0.50 to 0.87, indicating reliability ranging from acceptable to high (Nunnally, 1978), with a mean item-total correlation of 0.56 (see Table 1).

*Subscale intercorrelations*

The PRAM subscales showed varying levels of intercorrelation. The Responsibility/monitoring scale was positively correlated with Activity regulation ($r$ = .179, p = .003) and Pressure to Exercise ($r$ = .352, p < .001). Activity regulation was additionally related to Overweight concern ($r$ = .434, p < .001), Rewarding parenting ($r$ = .267, p < .001) and Pressure to exercise ($r$ = .504, p < .001). Control of active behaviours was only associated with Rewarding parenting ($r$ = .175, p = .004). Overweight concern was also related to Rewarding parenting ($r$ = .232, p < .001) as well as to Pressure to exercise ($r$ = .372, p < .001). Rewarding parenting was related to Pressure to exercise ($r$ = .292, p < .001). None of the intercorrelation coefficients exceeded 0.80, indicating an absence of multicolinearity.

*Convergent and discriminant validity*

Two-tailed Spearman's correlations were run between the PRAM and the ARPPS to determine the validity of the PRAM. Specifically, convergent validity was assessed by exploring the relationships between the Responsibility/monitoring scale of the PRAM with the subscales of the ARPPS. Positive, significant correlations were found between PRAM Responsibility/monitoring with ARPPS logistic support ($r$ = .268, p < .001) and with ARPPS explicit modelling ($r$ = .146, p < .05). No other PRAM variables were significantly associated with the two ARPPS subscales, highlighting the PRAM's discriminant validity ($r$ < .098, p > .05 in all cases). These results were as expected, given that the ARPPS assesses logistic support and modelling which are likely to align with parents' reports of their

responsibility/monitoring of activity but not to more controlling activity parenting practices, and thus these findings confirm both the convergent and discriminant validity of the PRAM.

## Discussion

This study developed a new measure to assess the nature of parenting with regard to children's physical activity. The PRAM's questions assess parents' practices with their children regarding active and sedentary behaviours. The results from the principal component analysis supported a six factor model and six distinct subscales were created. These subscales reflect a broad range of potential parenting practices relating to children's activity. Indicators of factorability and the residuals suggested that the PRAM structure was good, and the PRAM attained good reliability and convergent and discriminant validity. These data provide support for the use of the PRAM with mothers of 4.5 to 9-year-old children and suggest that the PRAM is suitable for use in the following study.

## Study 2: Maternal predictors of activity parenting with their children

### Method

Following its successful creation, the PRAM was administered alongside measures of eating disorder symptoms and compulsive exercise in order to examine those factors that might be predictive of mothers' activity-related practices.

*Participants*

One hundred and seventy mothers of children aged 4.5 to 9 years (mean age 7 years, SD 1.21) were recruited via infant and junior schools in England. The mothers' mean age was 39 years (SD 5.08, range 24 to 54 years) and their mean BMI was 23 (SD 4.10, range 17 to 58). These mothers reported having a mean of five years of post-16 education (SD 2.74, range 0 to 18 years). Twenty-three percent of the mothers were housewives and 38% were managers, senior officials or had professional occupations, classified using the National Statistics Socio-economic Classification (Office for National Statistics, 2001). Eighty-

seven percent of the mothers reported their ethnicity as White British. Ninety-five percent of the mothers were the biological parent of the child they were reporting on. Where mothers had more than one child in this age range, they were asked to report on the eldest child. Of the 170 children in this sample, 98 were boys and 72 were girls. The mean age of the boys was 7 years (SD 1.20, range 4.5 to 9 years) and the mean age of the girls was also 7 years (SD 1.23, range 4.5 to 9 years). Children's BMI SD scores (BMI SDS), standardised for child age and gender, were calculated using the Child Growth Foundation's references for body mass index (Child Growth Foundation, 1996). For girls, the mean BMI SDS was 0.04 (range -3.78 to 4.11) and for boys, the mean BMI SDS was 0.17 (range -3.49 to 4.68). The ethnicity of 85% of the children was reported by their mothers as White British.

*Procedure*

Following institutional review board ethical clearance and informed consent, the mothers completed the same demographic questionnaire as outlined in Study 1 to provide information about themselves and their child. They subsequently completed the Parenting Related to Activity Measure (PRAM) and self-report measures of exercise beliefs and eating psychopathology.

*Measures*

Eating Disorders Examination Questionnaire (EDEQ; Fairburn & Beglin, 1994). The EDEQ is a self-report assessment of eating disorder psychopathology. In the current study, the behavioural items were excluded prior to administration and the remaining 22-items were used. These yield four subscales assessing dietary restraint, eating concern, shape concern, and weight concern. Responses are either made to indicate the number of occurrences of a particular behaviour within the past 28 days, ranging from 0 (no days) to 6 (every day), or responses refer to agreement with statements and range from 0 (not at all) to 6 (markedly). The EDEQ has been found to display good psychometric properties (e.g., Carter, Aime & Mills, 2001; Luce & Crowther, 1999; Mond, Hay, Rodgers, Owen & Beumont, 2004) and has

previously been used in non-clinical samples (e.g., Mond et al., 2004; Munn & Klump, 2003). In the current sample, Cronbach's alpha values were: α .81 (Restraint); α .75 (Eating concern); α .87 (Shape concern); α .75 (Weight concern).

Compulsive Exercise Test (CET; Taranis, Touyz & Meyer, 2011). The CET is a 24-item self-report measure intended to assess core features of excessive exercise within the eating disorders. It comprises five subscales: Avoidance and rule-driven behaviour (e.g., "If I miss an exercise session, I will try and make up for it when I next exercise"); Weight control exercise (e.g., "I exercise to burn calories and lose weight"); Mood regulation (e.g., "Exercise improves my mood"); Lack of exercise enjoyment (e.g., "I find exercise a chore"); Exercise rigidity (e.g., "My weekly pattern of exercise is repetitive"). Responses are made on a 6-point Likert scale ranging from 0 (never true) to 5 (always true) and higher scores indicate more pathological exercise behaviours. The CET has been shown to be valid and reliable and to be suitable for use in research with non-clinical women (Taranis et al., 2011). In the current sample, Cronbach's alpha values were: α .87 (Avoidance and rule-driven behaviour); α .82 (Weight control exercise); α .85 (Mood regulation); α .82 (Lack of exercise enjoyment); α .64 (Exercise rigidity).

*Data analysis*

A Kolmogorov-Smirnov test for normality revealed that much of the data were not normally distributed; therefore non-parametric analyses were performed wherever possible. To identify any potential covariates, preliminary two-tailed Spearman's rho correlations were used to correlate maternal and child BMI and age with the six PRAM subscales. A series of Mann Whitney U tests were used to determine differences in the activity-related parenting practices, eating and exercise behaviours of mothers of girls and mothers of boys. Finally, a series of stepwise multiple linear regressions were run to identify the best predictors of mothers' activity parenting practices with their sons and daughters separately. For each set of regressions the dependent variables were scores on the PRAM and the potential predictors were scores on the EDEQ, CET and any significant covariates.

## Results

*Characteristics of the sample*

Descriptive statistics for mothers of girls and mothers of boys are reported in Table 2. The sample had EDEQ scores that were in the normal range (Luce, Crowther & Pole, 2008; Mond et al., 2004) and their excessive exercise scores were comparable with other non-clinical female samples (Taranis et al., 2011). Mothers of sons reported significantly higher levels of activity responsibility/monitoring on the PRAM than mothers of daughters. Mothers of daughters reported significantly higher concerns about overweight than did mothers of sons.

*Identification of potential covariates and tests of difference*

There were no significant associations between maternal BMI with any of the PRAM subscales. Therefore, maternal BMI was not entered into any of the subsequent regressions. Maternal age correlated positively with Activity regulation ($r$ = .172, p = .026) and negatively with Rewarding parenting ($r$ = -.229, p = .003) and, hence, was entered into the subsequent regressions. Child age was also negatively associated with Rewarding parenting ($r$ = -.230, p = .003) while child BMI SDS correlated positively with the Overweight concern subscale ($r$ = .412, p < .001). Thus, child age and BMI SDS were also entered into each of the six subsequent regressions. Differences identified by the Mann-Whitney U tests (see Table 2), in conjunction with differences identified in the literature between the perceptions and behaviours of mothers of girls and mothers of boys (e.g., Agras et al., 1999; Gustafson & Rhodes, 2006), meant that the subsequent regression analyses were conducted separately for mothers of boys and mothers of girls.

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TABLE 2 ABOUT HERE

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Tables 3 and 4 report the stepwise multiple linear regression analyses conducted to consider the potential predictors of mothers' activity related parenting practices with their sons and with their daughters. Maternal age, child age and child BMI SDS were entered as predictor variables for each regression, alongside subscales from the EDEQ and CET.

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TABLE 3 ABOUT HERE

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*Predictors of mothers' activity parenting practices with sons (Table 3)*

There were no significant predictive effects of child age on PRAM scores in mothers of boys. Child BMI SDS significantly predicted higher reported levels of mothers' Responsibility/monitoring of their son's activity behaviours. Child BMI SDS and maternal EDEQ-Eating concern also positively predicted mothers' concerns about overweight in their sons.

Mothers' age and exercise beliefs were also significant statistical predictors of PRAM scores. In particular, high CET-Exercise rigidity scores and higher maternal age predicted high PRAM-Activity regulation scores. Mothers' CET-Mood regulation scores predicted higher PRAM-Control of active behaviours with their sons. Lower levels of EDEQ-Restraint in mothers also significantly predicted higher maternal control of their son's active behaviours.

There were no significant predictors of PRAM-Rewarding parenting or Pressure to exercise in mothers of boys.

*Predictors of mothers' activity parenting practices with daughters (Table 4)*

Maternal and child age did not significantly predict any PRAM scores in mothers of girls. However, higher child BMI SDS predicted mothers' concern about overweight in their daughters.

There were also significant predictive effects of maternal eating and exercise behaviours upon PRAM scores. Specifically, PRAM-Responsibility/monitoring of activity with girls was significantly predicted by mothers' higher reported levels of CET-Weight control

exercise and lower levels of EDEQ-Restraint. Mothers' lack of exercise enjoyment predicted higher levels of activity regulation with their girls. High CET-Avoidance and rule driven exercise scores in mothers predicted greater control of their daughters' active behaviours. Mothers' rewarding parenting with their daughters was predicted solely by maternal exercise beliefs; specifically, higher scores on CET-Weight control, Mood regulation and Exercise rigidity. Finally, mothers' reports of pressuring their daughters to be active were predicted by higher maternal EDEQ-Eating concern and CET-Exercise rigidity scores, and by higher child BMI SDS.

## Discussion

The aim of study two was to identify the statistical predictors of mothers' activity-related parenting with girls and boys. In keeping with the hypothesis, different predictors of activity parenting practices were evident in mothers of boys and mothers of girls. Mothers' activity parenting practices were predicted by a combination of maternal eating and exercise beliefs, child BMI and maternal age, providing support for our hypothesis.

These findings provide initial evidence for the role of maternal beliefs about exercise and eating in their parenting around activity with their young children. In accordance with Costanzo and Woody's (1985) suggestion that parents are more controlling in areas in which they are either more invested or perceive risks for their child, more controlling activity parenting practices were predicted by more compulsive exercise beliefs and by greater levels of pathological eating. This was particularly the case for mothers of girls. Mothers were more controlling of their daughters' activity when they perceived their own exercise to be rule driven and they used more pressure when they felt that their own exercise regime was rigid. Such findings may be an important first step towards considering the potential intergenerational transmission of disordered attitudes and cognitions around exercise. Given the established links between mothers' disordered eating cognitions and behaviours and the development of problematic eating in their children (Patel et al., 2002) these findings could

suggest that a similar transmission of pathological attitudes towards exercise may transfer from parent to child.

The fact that there were no significant predictors of mothers' reports of using rewarding parenting or pressure to exercise with their sons, while numerous significant predictors explained a good proportion of the variance for each of these practices in mothers of daughters, likely reflects the fact that mothers' input regarding physical activity is different with daughters than with sons. This difference could be due to the boys in the sample being generally more active than the girls or, alternatively, it could reflect the societal emphasis placed upon the thin ideal for females and the manifestation of these ideals in parenting practices, as has been identified with regards to feeding practices (e.g., Birch & Fisher, 1995; Carper, Fisher & Birch, 2000). Given that boys are typically more active than girls (e.g., Riddoch et al., 2007), it could be that boys therefore elicit less varied maternal activity-related parenting, which may help to explain the results found in the current study. Another possibility is that paternal factors may be more salient predictors of boys' activity behaviours than maternal factors. Further research which assesses children's activity levels and which includes fathers is required to test these suggestions. However, the mother-daughter relationship regarding exercise attitudes and beliefs could be important for clinicians working within the eating disorders to be aware of.

Child BMI was a significant predictor of mothers' activity-related parenting, specifically predicting greater concern about overweight in girls and boys, increased responsibility/monitoring of activity in boys and greater pressure to exercise in girls. These findings suggest that, in addition to mothers' beliefs about their own eating and exercise, their parenting around activity may be related to their child's weight status. However, it is noteworthy that child BMI in this study was obtained by parental self-report. Thus, perceptions of children's weight status may be tied in to parents' reports of their child's height and weight. Despite this, evidence suggests that parents can be accurate at reporting their children's height and weight (Haycraft & Blissett, 2008) and, were this to be the case for the current sample, these findings may suggest that mothers' activity parenting is responsive to

their child's weight status. This is potentially encouraging but further work with objective BMI measurements is required. Furthermore, maternal BMI was not related to any activity parenting practices. This suggests that mothers' attitudes about exercise and eating are more important in determining their parenting about activity than their own BMI or weight status. This could be important if individuals of healthy weight status have maladaptive cognitions about eating and exercise as these may adversely influence parents' activity parenting practices. Further work looking at this is required.

Clearly these results require replication and extension in order to gain a clearer understanding of these complex interactions. Moreover, it is important to establish the short-, medium- and long-term predictive effects of different types of parenting around activity on the child's levels of physical activity.

## General Discussion

The aims of this research were twofold. First, to develop a new measure to assess parenting practices related to children's physical activity. Second, to determine the specific maternal predictors of such practices among mothers of young children. A six-factor measure of parenting related to activity (the PRAM) was successfully created and implemented and specific maternal predictors of activity parenting practices were identified.

Despite the need for further research, the practice implications of the findings from studies one and two are numerous. First, from a public health standpoint the findings suggest that work with parents to modify their own beliefs about exercise (particularly reducing rigid and compulsive exercise) may impact upon the way in which they engage with their children (particularly daughters) concerning physical activity. In addition, although the intergenerational transmission of compulsive exercise has not been adequately researched, it is plausible that such parenting practices may, in some cases, be important in the development of pathological exercise within adolescence and early adulthood. This would seem likely given that the importance of early experience in the development of other forms of compulsive psychopathology (for instance, binge-eating and purging behaviours; Tereno,

et al., 2008; Wade et al., 2007) has already been highlighted. Therefore, therapeutically targeting such interactions through early family therapy for those children and adolescents considered at risk of exercise psychopathology might be fruitful.

It is currently unknown what the potential longitudinal implications of overly-controlling parenting practices regarding active and sedentary behaviours may be. Work in other health domains, such as feeding, has found excessive control to be associated with less optimal child outcomes, such as overweight and an inability to regulate internal hunger and satiety cues (e.g., Fisher & Birch, 1999, 2002), and this has been further supported by recent work which found parental encouragement for their children to be active to have unintended consequences in adolescent girls (Davison & Deane, 2010). Given these findings, further work is recommended to examine the potential role of activity-related parenting practices in children's exercise and activity behaviours over time and the creation of the PRAM will facilitate exploration of this. It is likely that parental modelling or facilitation children's activity, rather than control of it, may be more effective at promoting healthy attitudes towards exercise and weight throughout childhood and into adulthood.

This research has made an important first step in exploring the predictors of parents' use of activity-related parenting practices and highlighting potential factors which may be involved in the development of later problematic exercise beliefs. These preliminary findings are encouraging but limitations of this research should be acknowledged. The PRAM is a new measure which requires further validation and testing. Despite evidence within the current study of strong factor loadings and good initial reliability and convergent and discriminant validity, validation among other samples (e.g., fathers, mother of older/younger children), and evidence of test-retest reliability is needed. As such, the findings should be interpreted with due caution. The data were based on self-report methods which may be subject to bias. The generalisability of these findings is limited to mothers of 4.5 to 9-year-old children, and further work with other samples (for example, fathers, who may be particularly involved in activity-related parenting; Davison et al., 2003) is required. The ethnicity of the participants was fairly homogenous, with over 85% reporting their ethnicity as White British.

Future studies should therefore aim to recruit more ethnically diverse samples of parents and explore their activity-related parenting practices in order to determine whether there are any differences in attitudes towards exercise/activity across ethnic groups. Finally, now that the efficacy of the PRAM has been established, future work should consider it alongside objective measures of both parent and child activity levels.

In conclusion, the PRAM has utility in assessing parenting practices relating to children's activity, which could have important implications for children's future health and attitudes towards exercise. This work provides initial evidence regarding the potential origins of problematic beliefs about exercise in some individuals. Activity-related parenting practices have been shown to be predicted by more pathological maternal exercise and eating beliefs and by child BMI and maternal age, and this pattern of predictors has been shown to differ for mothers of girls and mothers of boys. Further work with a longitudinal design is needed to build on these findings.

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*Table 1: Factor loadings and corrected item-total correlations ($r^{it}$) of the final Parenting Related to Activity Measure (PRAM) items (N = 233).*

| Factors, item numbers & item text | Factor loadings[a] 1 | 2 | 3 | 4 | 5 | 6 | Corrected item-total correlations |
|---|---|---|---|---|---|---|---|
| **Factor 1: Responsibility / monitoring** | | | | | | | |
| 1. When your child is at home, how often are you responsible for encouraging her/him to partake in physical activities (e.g., swimming, ballet, walking to school)? | **.658** | | | | | | .57 |
| 2. How often are you responsible for deciding how much time your child spends engaged in physical activities? | **.640** | | | | | | .61 |
| 3. How often are you responsible for deciding if your child has spent enough time doing sedentary activities (e.g., watching TV or playing computer/video games)? | **.680** | | | | | | .52 |
| 4. How much do you keep track of the active behaviours that your child engages in (e.g., playing football, walking to school, swimming etc.)? | **.745** | | | | | | .55 |
| 5. How much do you keep track of your child's sedentary behaviour (e.g., watching TV, playing computer or video games, reading books)? | **.846** | | | | | | .63 |
| 6. How much do you keep track of the active behaviours that your child engages in at school? | **.620** | | | | | | .49 |
| **Factor 2: Activity regulation** | | | | | | | |
| 10. If I did not guide or regulate my child's physical activity, s/he would do much less than s/he should. | | **.790** | | | | | .63 |
| 11. I have to be sure that my child does not engage in too many sedentary behaviours (e.g., watching TV, playing computer/video games, reading books). | | **.690** | | | | | .57 |
| 13. If I did not restrict my child's sedentary behaviours, s/he would spend too long not being active enough. | | **.870** | | | | | .71 |
| **Factor 3: Control of active behaviours** | | | | | | | |
| 15. I have to be sure that my child does not engage in too much physical activity (e.g., playing football or doing gymnastics). | | | **.901** | | | | .78 |
| 16. I have to limit the amount of physical activity that my child engages in (e.g., running, playing sports, going swimming). | | | **.923** | | | | .83 |
| 17. If I did not restrict my child's active behaviours, s/he would partake in too many of her/his favourite activities (e.g., running, football). | | | **.853** | | | | .73 |
| **Factor 4: Overweight concern** | | | | | | | |
| 19. How concerned are you about your child being too sedentary when you are not around her/him? | | .571 | | **.440** | | | .43 |
| 20. How concerned are you about your child needing to take part in exercise to maintain a desirable weight? | | | | **.885** | | | .77 |
| 21. How concerned are you about your child becoming overweight? | | | | **.906** | | | .72 |
| **Factor 5: Rewarding parenting** | | | | | | | |
| 12. I intentionally keep computer games or DVDs/videos out of my child's reach. | | | | | **.592** | | .28 |
| 14. I offer my child her/his favourite sedentary activities (e.g., 30 extra minutes of TV watching) in exchange for good behaviour. | | | | | **.667** | | .33 |

*Table 1 (cont): Factor loadings and corrected item-total correlations ($r^{it}$) of the final Parenting Related to Activity Measure (PRAM) items (N = 233).*

| Factors, item numbers & item text | Factor loadings[a] 1 | 2 | 3 | 4 | 5 | 6 | Corrected item-total correlations |
|---|---|---|---|---|---|---|---|
| **Factor 5: Rewarding parenting (cont.)** | | | | | | | |
| 18. I offer physical activities (e.g., going swimming, going to ballet) to my child as a reward for good behaviour. | | | | | **.689** | | .35 |
| **Factor 6: Pressure to exercise** | | | | | | | |
| 7. My child should always engage in physical activities that are available to her/him. | | | | | | **.745** | .39 |
| 8. I have to be especially careful to make sure my child exercises enough. | | .411 | | | | **.610** | .42 |
| 9. I try to get my child to do something active even if s/he would prefer to be doing something sedentary. | | | | | | **.509** | .40 |
| **Eigenvalues** | 4.31 | 2.83 | 2.61 | 1.53 | 1.47 | 1.02 | |
| **Variance explained (%)** | 20.50 | 13.46 | 12.45 | 7.27 | 6.98 | 4.87 | |
| **Alphas** | .800 | 792 | .886 | .787 | .503 | .583 | |

[a] *Note that factor loadings are only shown for values >.400 (Field, 2009).*

*Table 2: Descriptive statistics and Mann Whitney U tests of difference for mothers of boys and mothers of girls*

| | Mothers of boys (n=98) | | Mothers of girls (n=72) | | Mann Whitney U |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Z scores |
| **Parenting Related to Activity Measure (PRAM)** | | | | | |
| Responsibility/monitoring | 4.17 | 0.53 | 3.94 | 0.55 | -2.68** |
| Activity regulation | 3.06 | 1.11 | 3.00 | 1.03 | -0.51 |
| Control of active behaviours | 1.79 | 1.00 | 1.91 | 0.89 | -1.31 |
| Overweight concern | 2.05 | 1.27 | 2.78 | 1.35 | -3.43** |
| Rewarding parenting | 2.37 | 1.00 | 2.46 | 1.01 | -0.54 |
| Pressure to exercise | 3.59 | 0.92 | 3.63 | 0.74 | -0.17 |
| **Compulsive Exercise Test (CET)** | | | | | |
| Avoidance and rule-driven behaviour | 1.35 | 0.91 | 1.44 | 0.85 | -0.60 |
| Weight control exercise | 2.39 | 1.15 | 2.66 | 1.05 | -1.31 |
| Mood regulation | 3.17 | 1.07 | 3.16 | 0.87 | -0.34 |
| Lack of exercise enjoyment | 1.89 | 1.05 | 1.63 | 0.98 | -1.71 |
| Exercise rigidity | 2.65 | 1.15 | 2.70 | 1.10 | -0.08 |
| **Eating Disorder Examination Questionnaire (EDEQ)** | | | | | |
| Restraint | 1.15 | 1.31 | 1.38 | 1.35 | -1.56 |
| Eating concern | 0.55 | 0.82 | 0.63 | 0.85 | -1.03 |
| Shape concern | 1.94 | 1.42 | 1.95 | 1.46 | -0.15 |
| Weight concern | 1.55 | 1.32 | 1.49 | 1.20 | -0.08 |

**p≤.01

*Table 3: Stepwise multiple linear regressions to predict activity parenting practices in mothers of sons (only final models are shown).*

| | Mothers of sons (n=98) | | | | |
|---|---|---|---|---|---|
| *Dependent variable PRAM* | Significant predictors | Model $R^2$ | Model F | t | Beta |
| Responsibility / monitoring | Child BMI SDS | .106 | 5.82* | 2.41* | .33 |
| Activity regulation | Exercise rigidity (CET) | .223 | 6.89** | 3.16** | .40 |
| | Maternal age | | | 2.14* | .27 |
| Control of active behaviours | Restraint (EDEQ) | .173 | 5.03** | -2.37* | -.31 |
| | Mood regulation (CET) | | | 2.27* | .30 |
| Overweight concern | Child BMI SDS | .276 | 9.16*** | 3.10** | .38 |
| | Eating concern (EDEQ) | | | 2.93** | .36 |
| Rewarding parenting | -- | | | | |
| Pressure to exercise | -- | | | | |

*p≤.05, **p≤.01, *** p≤.001

CET: Compulsive Exercise Test; EDEQ: Eating Disorder Examination Questionnaire.

*Table 4: Stepwise multiple linear regressions to predict activity parenting practices in mothers of daughters (only final models are shown).*

| | Mothers of daughters (n=72) | | | | |
|---|---|---|---|---|---|
| *Dependent variable PRAM* | Significant predictors | Model $R^2$ | Model F | t | Beta |
| Responsibility / monitoring | Weight control exercise (CET) | .301 | 6.66** | 3.57** | .58 |
| | Restraint (EDEQ) | | | -2.08* | -.34 |
| Activity regulation | Lack of exercise enjoyment (CET) | .178 | 6.92* | 2.63* | .42 |
| Control of active behaviours | Avoidance & rule driven behaviour (CET) | .141 | 5.28* | 2.30* | .38 |
| Overweight concern | Child BMI SDS | .289 | 13.00*** | 3.61*** | .54 |
| Rewarding parenting | Weight control exercise (CET) | .610 | 15.09*** | 2.56** | .40 |
| | Mood regulation (CET) | | | 2.95** | .37 |
| | Exercise rigidity (CET) | | | 2.20* | .28 |
| Pressure to exercise | Eating concern (EDEQ) | .532 | 11.35*** | 4.53*** | .59 |
| | Exercise rigidity (CET) | | | 4.18*** | .59 |
| | Child BMI SDS | | | 3.12** | .45 |

*p≤.05, **p≤.01, *** p≤.001

CET: Compulsive Exercise Test; EDEQ: Eating Disorder Examination Questionnaire.

Appendix 1: The Parenting Related to Activity Measure (PRAM) and scoring details

**Instructions:** Using the scale below, please circle one number for each question which best corresponds to your answer.

| | Never | Seldom | Half of the Time | Most of the Time | Always |
|---|---|---|---|---|---|
| 1. When your child is at home, how often are you responsible for encouraging her/him to partake in physical activities (e.g. swimming, ballet, walking to school)? | 1 | 2 | 3 | 4 | 5 |
| 2. How often are you responsible for deciding how much time your child spends engaged in physical activities? | 1 | 2 | 3 | 4 | 5 |
| 3. How often are you responsible for deciding if your child has spent enough time doing sedentary activities (e.g. watching TV or playing computer/video games)? | 1 | 2 | 3 | 4 | 5 |
| | Never | Rarely | Some-times | Mostly | Always |
| 4. How much do you keep track of the active behaviours that your child engages in (e.g. playing football, walking to school, swimming etc.)? | 1 | 2 | 3 | 4 | 5 |
| 5. How much do you keep track of your child's sedentary behaviour (e.g. watching TV, playing computer or video games, reading books)? | 1 | 2 | 3 | 4 | 5 |
| 6. How much do you keep track of the active behaviours that your child engages in at school? | 1 | 2 | 3 | 4 | 5 |

Using the scale below, please circle one number for each question which best corresponds to your answer.

| | Disagree | Slightly Disagree | Neutral | Slightly Agree | Agree |
|---|---|---|---|---|---|
| 7. My child should always engage in physical activities that are available to her/him. | 1 | 2 | 3 | 4 | 5 |
| 8. I have to be especially careful to make sure my child exercises enough. | 1 | 2 | 3 | 4 | 5 |
| 9. I try to get my child to do something active even if s/he would prefer to be doing something sedentary. | 1 | 2 | 3 | 4 | 5 |
| 10. If I did not guide or regulate my child's physical activity, s/he would do much less than s/he should. | 1 | 2 | 3 | 4 | 5 |
| 11. I have to be sure that my child does not engage in too many sedentary behaviours (e.g. watching TV, playing computer/video games, reading books). | 1 | 2 | 3 | 4 | 5 |
| 12. I intentionally keep computer games or DVDs/videos out of my child's reach. | 1 | 2 | 3 | 4 | 5 |
| 13. If I did not restrict my child's sedentary behaviours, s/he would spend too long not being active enough. | 1 | 2 | 3 | 4 | 5 |
| 14. I offer my child her/his favourite sedentary activities (e.g. 30 extra minutes of TV watching) in exchange for good behaviour. | 1 | 2 | 3 | 4 | 5 |
| 15. I have to be sure that my child does not engage in too much physical activity (e.g. playing football or doing gymnastics). | 1 | 2 | 3 | 4 | 5 |
| 16. I have to limit the amount of physical activity that my child engages in (e.g. running, playing sports, going swimming). | 1 | 2 | 3 | 4 | 5 |
| 17. If I did not restrict my child's active behaviours, s/he would partake in too many of her/his favourite activities (e.g. running, football). | 1 | 2 | 3 | 4 | 5 |
| 18. I offer physical activities (e.g. going swimming, going to ballet) to my child as a reward for good behaviour. | 1 | 2 | 3 | 4 | 5 |

Using the scale below, please circle one number for each question which best corresponds to your answer.

| | Unconcerned | Slightly unconcerned | Neutral | Slightly concerned | Concerned |
|---|---|---|---|---|---|
| 19. How concerned are you about your child being too sedentary when you are not around her/him? | 1 | 2 | 3 | 4 | 5 |
| 20. How concerned are you about your child needing to take part in exercise to maintain a desirable weight? | 1 | 2 | 3 | 4 | 5 |
| 21. How concerned are you about your child becoming overweight? | 1 | 2 | 3 | 4 | 5 |

Parenting Related to Activity Measure (PRAM) scoring details

Mean scores are calculated for each subscale using the following items:

- Responsibility/monitoring: items 1, 2, 3, 4, 5, 6
- Activity regulation: items 10,11,13
- Control of active behaviours: items 15, 16, 17
- Overweight concern: items 19, 20, 21
- Rewarding parenting: items 12, 14, 18
- Pressure to exercise: items 7, 8, 9