

My mother told me: the roles of maternal messages, body image, and disordered eating in maladaptive exercise

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Received: 27 July 2015 / Accepted: 21 October 2015 / Published online: 7 November 2015
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Abstract

Purpose The current study examined the relevance of familial environment (negative maternal messages) to the phenomenon of maladaptive (obligatory) exercise, defined as exercise fixation. Weight/shape concerns and exercise frequency were examined as potential mediators, evaluated both with and without eating disorder symptoms as a covariate.

Method Self-report data comprising sociodemographic details and measures of parental weight messages, body image, obligatory exercise, and disordered eating symptoms were completed by 298 young female attendees of health and fitness centres.

Results The frequency of negative maternal messages demonstrated significant associations with all of weight/shape concerns, exercise frequency, exercise fixation, and eating disorder symptoms. In the initial model, partial mediation of maternal messages to exercise fixation was evident as negative maternal messages continued to have a direct effect on exercise fixation. In the second model, with

the inclusion of eating disorder symptoms as a covariate, this direct effect was maintained while mediation was no longer evident.

Conclusions The data provide further support for the association between disordered eating symptoms and maladaptive exercise, as defined by exercise fixation. Nevertheless, the importance of negative maternal messages as a key environmental enabler of exercise fixation has been demonstrated, even after the effects of weight/shape concerns and exercise frequency were accounted for. Clinically, addressing weight-related talk in the family home may reduce the incidence of problematic cognitions and behaviours associated with both maladaptive exercise and disordered eating symptoms.

Keywords Maternal messages · Obligatory exercise · Body image · Weight/shape concerns · Disordered eating · Mediation

Introduction

Extreme exercise may become physically and psychologically damaging [1]. In such situations, terms such as exercise dependence [2], obligatory exercise [1], and exercise addiction [3] are often applied [4]. However, to avoid the imperative definitions associated with such labels, the more general term of maladaptive exercise is proposed to introduce the addictive, compulsive, and obsessive elements of this phenomenon. Further, it is noted that the more specific labels are commonly misapplied [4], with studies being more concerned with the continuum of addictive or obligatory behaviour, for example, than the fact of being ‘addicted’ or feeling ‘obligated’ [3, 5]. Indicators of maladaptive exercisers may include the experience negative affect such as

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guilt if unable to exercise [6, 7], with exercise frequently taking priority over everyday activities [8]. Exercise can be undertaken in response to negative situations, with the exercise carrying an emotional component [6, 9]. Conversely, maladaptive exercise can itself have a negative impact on emotions and cognitions [10].

Excessive amounts of exercise are not necessarily the defining feature of maladaptive exercise, making the phenomenon somewhat difficult to determine. While a high frequency of exercise has been identified as relating to maladaptive exercise [11], the identification of maladaptive exercise needs to distinguish between normally functioning high-frequency exercisers (such as elite athletes) and those for whom high-frequency exercise is maladaptive. That is, an assessment of both the severity (frequency) and functional impact (fixation) of exercise is required. The current study assessed both exercise frequency and fixation, as frequency without fixation may only constitute a healthy training schedule, as seen among athletes, whereas fixation without frequency may not have a negative impact on physical or indeed psychological health.

Prevalence estimates for maladaptive exercise vary, with reported figures from 42 % among female clients of a gymnasium [12], to 18 % for athletes [13], to 3 % among habitual male and female exercisers [14, 15], and as low as 0.3 to 0.5 % in the general adult population [16]. This variation can be attributed to the composition of the sample reported, such as gender distributions, and also the measures with which maladaptive exercise is evaluated, which may include addiction versus obligation versus dependence, for example [4]. Nevertheless, given this variability, the identification of factors that serve to increase or decrease prevalence may ultimately lead to its better understanding. On this basis the current study examined two such potential influences on maladaptive exercise, operationalised as the felt obligation to exercise. These were familial environment (maternal messages to daughters) and body image concerns (operationalized as weight/shape concerns). Further, as there is common comorbidity between maladaptive exercise and eating disorders [17–20] the predictive model is presented first without reference to eating disorders, but is then re-analysed including eating disorder as a covariate. In this way the relative importance of the nominated predictor variables can be examined both independently of eating disorder symptoms, but also when the influence of such symptoms are first excluded from the relevant equations.

Maternal messages related to weight and shape may be conveyed in two ways. First, the child may learn specific behaviours and attitudes (e.g., to dieting, to appearance-related evaluations) from observation or modelling. Second, direct influence may involve weight-related talk with the child receiving specific positive or negative feedback relating to weight, shape or eating habits [21–26]. Such

maternal messages appear to be particularly salient to women [22, 24, 25, 27], with research focused predominantly on disordered eating behaviour [24, 25, 28]. For example, Hanna and Bond [29] reported higher levels of eating disorder symptomatology in daughters as both family conflict and negative maternal messages increased, and Cooley et al. [22] noted a similar association, but with close relationships between mother and daughter decreasing the likelihood of eating disorder symptoms.

Weight/shape concern is a common cognitive construct among those with a maladaptive exercise regimen [30]. For example, following an exercise session, perceptions of both body size and body image have been noted to be more positive among those with higher weight/shape concerns, suggesting that exercise may be used as a method of reducing unpleasant cognitions about weight/shape [31]. The relationship between weight/shape concern and exercise is further highlighted through interventions to reduce weight/shape concern, which also prove effective in reducing excessive amounts of exercise [32], although it is unknown whether such interventions impact maladaptive exercise specifically. Weight/shape concern is also an established risk factor for clinically significant eating disorders [33], and tends to be elevated in those with disordered eating more generally and secondary maladaptive exercise, in which the motivation for exercise is mainly weight control [17, 19, 34–36].

To summarise, there is clear evidence that maladaptive exercise may be influenced by multiple variables, many of which are likely to be interrelated. The aim of the current study was to examine a number of these potential influences using a serial mediation methodology. Specifically, among a non-clinical female sample it was hypothesised that maternal messages would contribute to maladaptive exercise (operationalised as exercise fixation), with weight/shape concerns and exercise frequency as potential mediators. These mediators were chosen on the proposition that the primary result of negative maternal messages may be their translation to either weight/shape concerns, frequent exercising, or both, which may then be key drivers of maladaptive exercise rather than maternal messages per se. Mediations were evaluated with and without disordered eating as a covariate to allow further commentary on the relative likelihood of maladaptive exercise being a primary disorder (independent of disordered eating) or secondary disorder (manifesting predominantly in the presence of disordered eating symptoms).

Method

Participants and procedure

Eligible participants were women attending one of ten health and fitness centres located in Adelaide, South

Australia, chosen on the basis of their proximity to the authors' institution. All those approached agreed to participate. The full sample ($n = 302$) has previously been reported [37]. The current sample comprises those women ($n = 298$) who nominated a maternal guardian and were, therefore, able to complete the Parental Eating and Weight Messages Questionnaire. Questionnaires were distributed by centre managers who gave potential participants a prepared standard verbal briefing of the aims: 'The study is interested in the associations between body image, commitment to exercise, and symptoms of eating disorders. The potential importance of early maternal messages in the development of body image will also be explored.' Interested clients were then supplied with a questionnaire and prepaid envelope for its anonymous return, although sealed collection boxes were also available if more convenient. Of all questionnaires distributed to centres, 63 % were returned. However, this is likely to be an underestimate of the true completion rate due to an indeterminate number of blank questionnaires being inadvertently discarded by managers rather than being distributed to clients or returned to the researchers at the completion of the recruitment period.

Questionnaire

Self-reported age, height, current and desired weight, and length of time as a regular exerciser were sought, along with responses to the following scales.

Maternal messages concerning eating and weight

The Parental Eating and Weight Messages questionnaire assesses the messages communicated from parents regarding their daughters' eating and weight [38]. All items are statements preceded by "My mother/father would say/said/asked me ...". Responses are recorded on a 5-point scale ('never' to 'always'). Appropriate levels of reliability and validity have been cited [29, 38]. In the current study, only 15 items (negative messages communicated from mother to daughter) were used, with reference to father removed. This action is supported by literature showing that fathers have less involvement and influence in their daughters' dieting and eating habits compared to mothers [38]. Scores ranged from 15 to 75, and the current sample provided an internal consistency estimate (α) of 0.93.

Body image

Five and eight items, respectively, from the Eating Disorder Examination-Questionnaire (EDE-Q) were used to assess weight/shape concerns [39]. Consistent with common practice these were treated as a single scale. As one

item is repeated for each of weight and shape it was included only once. Responses to all items are recorded using 7-point scales ranging from 0 to 6, then summed, and divided by 12 (the number of items). Higher scores indicate greater psychopathology. The EDE-Q is considered a highly reliable and valid instrument [40, 41]. Internal reliability for the current sample was 0.96.

Obligatory Exercise Questionnaire (OEQ)

The 20-item OEQ assesses attitudes toward exercise routines [42]. Participants respond to each statement as it applies to them using four responses ranging from 'never true' to 'always true'. Items are summed, resulting in a score ranging from 20 to 80, with higher scores representing a stronger perceived obligation to exercise. Sound reliability and validity data have been reported for the OEQ [42, 43]. The results of numerous factor analyses of the OEQ items have been reported, with that of Lease and Bond [37] having applied more rigorous rules for the retention of factors [44]. These authors advocate two rather than three subscales. These were 'exercise frequency', comprising nine items (e.g., 'I exercise more than three days per week', 'I frequently push myself to the limits') with a score range of 9–36 ($\alpha = 0.88$) and 'exercise fixation' (e.g., 'I have had daydreams about exercising', 'When I miss a scheduled exercise session I may feel tense, irritable or depressed'), comprising eight items (range 8–32, $\alpha = 0.88$). Higher scores represent a stronger perceived obligation to exercise.

Eating disorder symptoms

The Eating Attitudes Test (EAT-26) is a widely used, reliable, and valid measure of atypical, disturbed or excessive eating behaviours [45]. While high scores are not necessarily indicative of a diagnosable disorder, up to 90 % accuracy has been noted using the EAT-26 as a screening test for eating disorders in non-clinical samples [46]. A 6-point response scale ('never', 'rarely', 'sometimes' = 0, 'often' = 1, 'usually' = 2, 'always' = 3) is used, with higher scores (range 0–78) reflecting increased disordered eating pathology. While three subscales have been established (dieting, bulimia, and food preoccupation and oral control), only the total score is reported here. Internal reliability was 0.93.

Statistical analysis for mediation

Data were analysed using SPSS version 22.0. Serial mediation was tested using the procedures of Preacher and Hayes [47, 48] using a purpose-built macro (PROCESS v2.12.1). Regression coefficients are calculated for the

proposed first mediator (weight/shape concerns) on the predictor (maternal messages: X to $M_1 = a_1$), the outcome (exercise fixation) on the predictor (maternal messages: X to $Y = c'$), and the outcome (exercise fixation) on the first mediator (weight/shape concerns: M_1 to $Y = b_1$). Similarly, regression coefficients are calculated as described above but involving the second mediator (exercise frequency: X to $M_2 = a_2$; X to $M_2 = b_2$) and for the second mediator (exercise frequency) on the first (weight/shape concerns: M_1 to $M_2 = a_3$). The significance of all indirect effects are determined using a bootstrapped 95 % confidence interval (95 % CI) following 5000 iterations and are considered to differ from zero (demonstrating significant mediation) if their upper and lower bounds do not cross zero. Path c represents the total indirect effect between the predictor and outcome by way of the mediators, while c' quantifies the direct effect. The addition of a covariate (disordered eating symptoms) to this model involved the calculation of additional regression coefficients for the proposed mediators and the outcome on the covariate. Prior to all analyses, variables were standardised to enable the interpretation of coefficients as β .

Results

Descriptive statistics, including the age of participants and the length of time they had considered themselves to be regular exercisers, are summarised in Table 1. Correlations among these variables are also presented, indicating support at the bivariate level for all hypothesised associations. Conversely, years as a regular exerciser was largely

unrelated to study variables, while age shared modest associations with most variables.

The coefficients relevant to serial mediation without disordered symptoms are displayed in Fig. 1. The overall model ($F_{(3, 294)} = 213.95, p < 0.001, R^2 = 0.69$) demonstrates the significance of the bootstrapped estimate of the indirect effect (c) of negative maternal messages through weight/shape concerns to exercise frequency and exercise fixation (i.e., mediation). However, the continued significance of the direct effect (c') suggests partial rather than full mediation. That is, negative maternal messages continue to be associated directly with exercise fixation. All other paths were significant and of substantial magnitude with the exception of a_2 (maternal messages to exercise frequency).

The inclusion of disordered eating as a covariate (Fig. 2) resulted in the indirect path (c) between maternal messages and exercise fixation becoming non-significant, while the overall model fit remained significant and improved modestly ($F_{(4, 293)} = 194.72, p < 0.001, R^2 = 0.73$). The direct path (c') between maternal messages and exercise fixation remained significant. That is, the relationship between maternal messages and exercise fixation was no longer mediated. The path from maternal messages to exercise frequency (a_2) was again non-significant and, while they did remain significant, the magnitude of all paths was reduced. Conversely, the paths involving disordered eating symptoms were substantial and significant. Of note is a_3 (weight/shape concerns to exercise frequency) which became negative. This is likely to be a statistical artefact affected by the third variable influence of disordered eating symptoms.

Table 1 Descriptive statistics and correlations among study variables

	<i>M</i>	(SD)	1	2	3	4	5	6
1. Age	22.3	(3.5)	–					
2. Years of regular exercise	7.8	(5.9)	0.27***	–				
3. Negative maternal messages	27.5	(11.4)	–0.27***	–0.12*	–			
4. Weight/shape concerns	2.9	(1.7)	–0.20***	–0.11	0.56***	–		
5. Exercise frequency	24.8	(5.7)	–0.10	0.06	0.25***	0.33***	–	
6. Exercise fixation	16.3	(5.3)	–0.23***	0.01	0.51***	0.61***	0.70***	–
7. Disordered eating symptoms	13.3	(14.4)	–0.22***	–0.09	0.50***	0.71***	0.56***	0.76***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Fig. 1 Serial mediation of maternal messages to exercise fixation by weight/shape concerns and exercise frequency (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$)

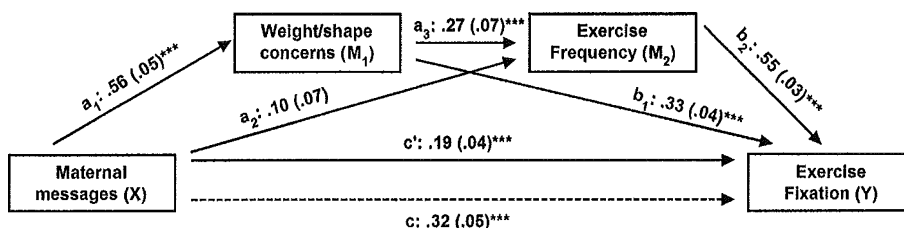
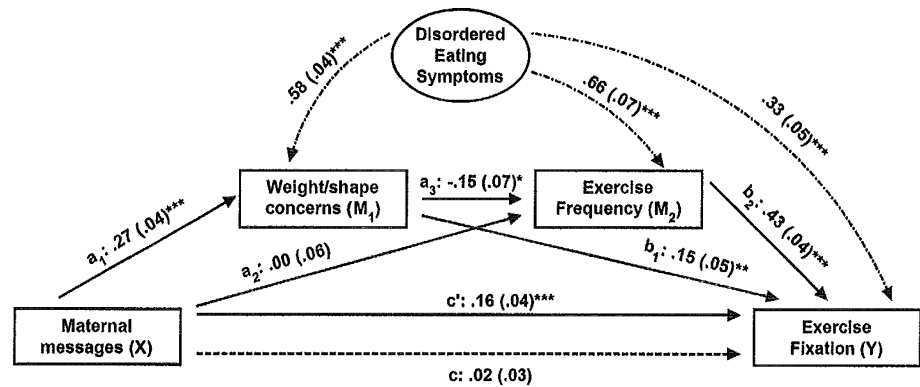


Fig. 2 Serial mediation of maternal messages to exercise fixation by weight/shape concerns and exercise frequency with disordered eating symptoms as a covariate (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$)



Discussion

The key goal of the current research was to examine the influence of familial environment on the healthy development of daughters. Several important findings emerged from the data. An unexpected finding was the importance of disordered eating in better explaining many of the hypothesised pathways in our model. There are several implications for this finding. The first is that maladaptive exercise in this non-clinical sample of women is mainly occurring in the presence of disordered eating symptoms (used as a means to achieve weight and shape control), thus providing support for previous body image research concerned with eating problems more specifically [24, 25, 28]. The second is that females presenting with maladaptive exercise may benefit from intervention to decrease disordered eating symptoms. Further, it may be important to screen for disordered eating in a clinical setting when maladaptive exercise is the presenting complaint, as disordered eating may be of more immediate concern.

Notwithstanding these comments, an important observation was also that a direct association between negative maternal messages and exercise fixation remained even after controlling for disordered eating symptoms in the final model. Thus the relevance of maternal messages to maladaptive exercise should not be discounted. That is, it is still apparent that negative maternal messages are related to problematic attitudes toward exercise for daughters, even in the absence of disordered eating symptoms. This is a unique finding that extends previous observations both of the importance of maternal messages and the importance of maladaptive exercise in response to negative situations when disordered eating is not a factor [6, 9].

Maternal messages may create a negative, stressful environment in which maladaptive exercise serves as a coping response. It can be further hypothesised that messages such as these contribute to negative emotionality or attitudes that extend to domains beyond body image and eating concerns. Future research may productively examine

emotional and attitudinal aspects unrelated to weight or dieting that potentially occur along with negative maternal messages. Variables that have been identified by similar research as being potentially relevant to the distinction between maladaptive and non-maladaptive exercise include personality traits (Extraversion, Agreeableness) and motivation (external versus internal), for example [49, 50].

Other findings of note include a number of direct relationships between variables, particularly after disordered eating was entered as a covariate. Specifically of note was the continuing significance (although less sizeable) of the association between weight/shape concerns and exercise fixation. These unhelpful cognitions appear to emerge even in the absence of problematic eating behaviour. The direct association between exercise frequency and exercise fixation also remained strong after controlling for disordered eating symptoms. That is, a higher frequency of exercise was a precursor to a greater degree of fixation on exercise. While those who objectively exercise more may be more likely to exhibit maladaptive exercise [11], consistent with the literature a high frequency of exercise does not automatically imply a maladaptive exerciser. It remains important to assess both components to avoid misidentification of persons who may exercise frequently due to, for example, training demands [35].

Our study has several strengths and limitations. First, our model used constructs frequently examined with each other (i.e., negative maternal messages and disordered eating, disordered eating and maladaptive exercise) but never together, with strong theoretical and empirical bases for inclusion in a single model. Further, the inclusion of body image and disordered eating variables in our model of maladaptive exercise (which commonly co-occur in a young female population) suggests reasonable confidence that the relationship between negative maternal messages and exercise fixation is not spurious. Despite the interesting findings from the current study, there are limitations on their interpretation. First, participants were self-selected

attendees at a health and fitness centre, immediately excluding those who elect not to exercise in a gymnasium environment. Generalizability could be improved by assessing different groups of exercisers (e.g., those who exercise in local parks, etc.) or at the very least by the ability to recruit a more representative sample from within health and fitness centres. Second, as alluded to earlier, there are issues concerning the nomenclature, measurement and interpretation of what we have generically termed maladaptive exercise in this study [37]. However, we have acknowledged and justified that we are examining the construct of maladaptive exercise as occurring on a continuum, and believe that we have examined variables most likely to be present in exercise that does not occur in a healthy context. It has also been noted in the literature that self-report measures do not have the ability to diagnose a clinically significant level of maladaptive exercise. Rather their capacity is predominantly to determine level of risk of developing such a problem [4].

While results of analyses such as ours may be different should different definitions and measures be used, it is argued that for a non-clinical sample the characterisation of maladaptive exercise along a psychological continuum is entirely defensible. The analyses presented address relative obligation to exercise and relative exercise frequency, just as scores for maternal messages and weight/shape concerns are relative constructs. Finally, the use of mediation procedures with cross-sectional data is contentious. Yet this application is common and there remains value in attempts to understand potential mediating roles of variables using cross-sectional data, even if only for future hypothesis testing.

The results of this study both reflect and have implications for the way weight is spoken about in the family home. Superficially, it seems important to teach families, particularly mothers and daughters, to engage in less weight-related conversation. Yet barriers to reducing weight-related talk must also be acknowledged. For example, negative maternal messages about weight and shape may reflect the mother's personal concerns, thus resulting in a cycle of weight-related feedback. Encouraging mothers to challenge their beliefs about weight and shape and seek help for any personal disordered eating tendencies may reduce the frequency of negative messages conveyed to daughters. A gradual move towards identifying instances of weight talk and thinking about their effects could also reduce future negative maternal messages. Future research may also focus on whether parental messages specifically contribute to primary or secondary maladaptive exercise in men through their effects on weight/shape concerns, in particular examining whether maternal or paternal messages make a more substantial contribution.

In light of these findings, it is also important to carefully evaluate the kind of messages sent by public health initiatives to encourage exercise, particularly in females. This may reinforce the idea that all exercise is desirable and confuse maladaptive exercise with a committed training schedule [35]. If campaigns focus on encouraging exercise as a means of controlling shape and weight, or do not stress the importance of balancing exercise and other activities, they may be analogous to negative maternal messages in contributing to maladaptive exercise and disordered eating.

In conclusion, it is evident that negative maternal messages are associated with maladaptive exercise: through weight/shape concern when disordered eating symptoms are not a factor, and directly to exercise fixation when disordered eating symptoms are considered. Further, our research reflects other literature suggesting that negative maternal messages contribute to weight/shape concerns, and in turn disordered eating. Exercise fixation may also be a product of the negative emotionality or stress resulting from maternal messages, even if these messages do not contribute to problems with poor body image or eating behaviours. Clinically, addressing how negative maternal messages, and weight-related talk in general, are conveyed in the family home could help reduce these outcomes. Indeed, as the circumstances that facilitate the development of maladaptive exercise or disordered eating may precede the onset of exercise and eating problems by several years, targeting negative maternal messages early in a daughter's development could be a key to reducing the later incidence of problematic cognitions and behaviours.

Acknowledgments The authors wish to acknowledge the assistance of Dr Melinda Stanners in the preparation and interpretation of the serial mediation analyses.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in this study were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments.

Informed consent Informed consent was obtained from all individual participants included in the study.

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