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1 **BRIEF REPORT**

2 Running header: Rehearsal, body image, and weight status in children

3

4 **Do children emotionally rehearse about their body image?**

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1 **Abstract**

2 This study examined the association between propensity for emotional rehearsal, body image
3 self-perception and weight status in Chinese Hong Kong pre-adolescents. Children aged 8-12y
4 (n=278) completed measurement of BMI, body image and emotional rehearsal. Multinomial
5 regression analyses revealed that BMI was positively associated with body image dissatisfaction
6 and a significant predictor of body size estimation. However, only body size underestimation is
7 associated with lower rehearsal tendencies. The prevalence of body image dissatisfaction and
8 body size estimation was also reported for this population. Future research is suggested for
9 greater understanding of emotional coping in body image dissatisfaction in young children.

10

11

12 Keywords: body image, obesity, coping, rehearsal, children

13

1 **Introduction**

2 Body image dissatisfaction is characterised by negative self-appraisal of one's body and
3 is often accompanied by body size misperception (in terms of underestimation or overestimation
4 of one's actual body size), both are common in overweight and normal weight children
5 (Skrzypek et al. 2001; Evans et al. 2013). While the majority of research has focused on body
6 image dissatisfaction in eating disorders, increasing evidence points to the importance of
7 considering body size misperception separately as the latter appeared to have different neuronal
8 orientations to eating disorders and that it may mediate the relationship between body image
9 dissatisfaction and eating disorders (Mohr et al. 2008; Mussap et al. 2008; Mohr et al. 2011)
10 Specifically, body image dissatisfaction elicited from body size overestimation (i.e., the
11 perception of being bigger than actual body size) is linked to anorexia nervosa, bulimia nervosa
12 and binge-eating disorder (Mussap et al., 2008; Mond et al. 2007; Castellini et al., 2012),
13 whereas body size underestimation (i.e., the perception of being smaller than actual body size) is
14 associated with overweight/obesity (Edwards et al 2010). The above evidence suggests that body
15 image dissatisfaction and body size misperception are likely to manifest in disordered eating
16 behaviours which could potentially be carried into adulthood (Stice et al. 2012).

17 Recently, researchers have proposed the possible role of rumination (i.e., the propensity
18 to recurrently focus on symptoms of distress and their possible causes and consequences) as a
19 psychological mechanism for body image dissatisfaction, body size misperception and related
20 eating pathologies, as well as their prolongation. For instance, rumination was among other
21 emotion regulation strategies that appeared to moderate the relationship between body image
22 concerns and bulimic symptoms in adolescent girls (Hughes and Gullone, 2011). Longitudinally,
23 rumination was found to be a predictor of increased eating pathology in seven months, and a

1 reciprocal relationship between rumination and bulimic and depressive symptoms was evident in
2 a 4-year period (McLaughlin et al. 2011; Nolen-Hoeksema et al. 2010). Additionally, Holm-
3 Denoma and Hankin (2010) showed that high ruminative adolescent girls with low physical
4 appearance competence were more likely to develop bulimic symptoms in 10 weeks than those
5 with high physical appearance competence. The above research has provided partial support for
6 rumination being a potential psychological mechanism for feeding one's negative body image
7 perception, which may have contributed to the exacerbation of eating pathologies. Essentially,
8 the greater propensity to focus on adverse experiences and thoughts may reinforce the
9 psychological stress and negative emotions generated from the unattained ideal body image
10 (Wegner, 1994; Martin and Tesser, 1996; Clark, 1996; Klinger, 1996). In an attempt to distract
11 or to relieve from the intensity of the psychological disturbances, maladaptive behaviours such as
12 disordered eating may result (Heatherton and Bauameister, 1991; Selby et al. 2008; Rawal et al.
13 2010). Whilst most body image research in the role of rumination has been conducted with
14 adolescents, little is known about the psychological mechanisms contributing to a disturbed body
15 image in pre-adolescents despite growing evidence on body image dissatisfaction and body size
16 misperception in this age group (Gardner et al. 1999). Nonetheless, research on emotional
17 rehearsal, a form of generic rumination, may shed some light on the how rumination may also
18 be a mechanism behind body image dissatisfaction in young children.

19 Emotional rehearsal refers to the tendency to have repetitive emotional thoughts about
20 upsetting experiences from in the past, present or possibly in the future (Roger and Nesshoever
21 1987). Emotional rehearsal has been linked to psychological stress in adults where abnormal
22 physiological response, i.e., notable cortisol elevation or slower heart rate recovery, was noted in
23 high rehearsers compared to low rehearsers (Roger and Jamieson 1988; Roger and Najarian

1 1998). Based on the above evidence, Ling et al. (2011) argued that their findings on the
2 association between rehearsal tendencies and excess adiposity in Chinese children could
3 potentially be explained by physiological, psychosocial, and/or behavioural factors that are
4 stress-related. It is possible that bigger children, who seemed more likely to possess a higher
5 rehearsal tendencies, might be more prone to misperception of their body size and/or that they
6 might be more dissatisfied with their current perceived body size which could be a regular source
7 of stress as reinforced by their constant focus on it. It is also possible that the recurrent negative
8 emotions associated with their unattained ideal body image may cause adiposity through the
9 psychoendocrinological or the behavioural pathway. Both explanations denote the possible link
10 between high rehearsal tendencies in childhood and body size dissatisfaction and misperceived
11 body size estimation, which are evident to be a source of anxiety for children across different
12 cultures (Hillman et al. 2010; Tang et al. 2010), yet their relationships have not been investigated.

13 In view of the above, we examined the association between rehearsal, body size
14 satisfaction, body size estimation and weight status in Chinese pre-adolescents. With thinner
15 body image ideals common in this age group (Kelly et al. 2011), we hypothesized that children
16 with higher BMI and greater rehearsal tendencies were more likely a) to be dissatisfied with their
17 body image and b) to overestimate their body size . The body image of Hong Kong Chinese
18 children has been under-studied despite some evidence of body image disturbance in Chinese
19 (see Soh et al. 2006). Therefore, another aim of the current study was to examine the prevalence
20 of body image dissatisfaction and body size misperception in Hong Kong children. The findings
21 have potential to be clinically valuable as Asian youth are showing a secular increase in
22 adiposity, which is leading to increasing cardiovascular disease risks (Lam et al. 2010;
23 Xanthopoulos et al. 2011). Further, with previous body image interventions demonstrating

1 limited success (McCabe et al. 2006), our results can potentially inform the design of future
2 interventions that may achieve greater sustainable effectiveness in alleviating body image
3 disturbance in young children.

4

5 **Method**

6 *Participants*

7 Parental consent was obtained from 278 children in Grade 4 to 6, representing
8 approximately 77.2% of the three year groups, from a local government aided school in the
9 southern district of Hong Kong. Assented participants were 8-12 years of age (mean age = 10.79
10 \pm .81 y; 50% boys), all completed the measures detailed below.

11

12 *Procedure*

13 Parental consent and detailed information about the study was sent to all parents of
14 students in Grade 4 to 6 through the participating school. The researchers' contact details were
15 provided on the information sheet and parents were encouraged to contact the researchers for any
16 questions regarding the study. Completed parental consent and student assent was returned to the
17 school in a sealed envelope which was then passed onto the research team. Under the
18 arrangement of the school, all assented participants completed the two questionnaires, the
19 Rehearsal Scale for Children – Chinese (RSC-C) first, followed by the Children's Body Image
20 Scale (CBIS), before having their anthropometric measurements taken in one morning of a
21 normal school day. All the measures and protocols were approved by the Institutional Review
22 Board for Human Ethics.

23

1 *Measurements*

2 *Anthropometry.* Stature and body mass were measured barefoot to the nearest 0.1cm and 0.1kg
3 respectively. For stature, a fixed stadiometer (Invicta 2007246, UK) was used and an electronic
4 scale (Tanita TBF-410 Japan) was used for measuring body mass.

5
6 *Children's Body Image Scale (CBIS).* The CBIS was designed to assess the self-perceived
7 current and ideal body image in 7-12 year-old children (Truby and Paxton 2002). The gender-
8 specific scale consists of seven child figures, each representing a BMI range within the 3rd to 97th
9 percentile (Hamill et al. 1979). The scale is presented in ascending order, with the corresponding
10 BMI range for boys for each percentile range on the scale (with a category number assigned to
11 each child figure) as 14.0–14.6 (3rd percentile) (1), 14.7–15.5 (10th percentile) (2), 15.6–16.5
12 (25th percentile) (3), 16.6–18.5 (50th percentile) (4), 18.6–24.9 (75th percentile) (5), 25.0–28.4
13 (90th percentile) (6), 28.5–29.0 (97th percentile) (7); whereas for girls it was 13.0–13.5 (3rd
14 percentile) (1), 13.6–14.9 (10th percentile) (2), 15.0–16.6 (25th percentile) (3), 16.7–17.7 (50th
15 percentile) (4), 17.8–19.4 (75th percentile) (5), 19.5–24.6 (90th percentile) (6), 24.7– 28.5 (97th
16 percentile) (7). Prior to their anthropometric measurements, participants were asked to indicate
17 the child figure that best represented their current body size (i.e., their perceived body size) and
18 their ideal body size. The questions were translated/back-translated from English to Chinese. The
19 CBIS has shown good construct validity and test-retest reliability ($r = .76$ and $.85$ for boys and
20 girls respectively) (Truby and Paxton 2008).

21 Based on the category number assigned to each CBIS child figure, body size satisfaction
22 was assessed by computing the difference between participants' perceived body size and their
23 ratings of their ideal body size (i.e., 'perceived minus ideal'). Directional interpretation was

1 completed on the basis of whether the difference was negative or positive. For example, a child
2 wanting a ‘thinner’ body size would score positively, whereas a child wanting to be ‘bigger’
3 would score negatively.

4 For body size estimation, the actual BMI of each participant was categorized into one of
5 the seven CBIS child figures. Participants’ body size estimation was categorized by grouping the
6 data into ‘accurate estimation’ (when the category number for the perceived size was the same as
7 that for the actual size), ‘underestimation’ (when the category number for the perceived size was
8 lower than that for the actual size) and ‘overestimation’ (when the category number for the
9 perceived size was higher than that for the actual size).

10

11 *Rehearsal Scale for Children – Chinese (RSC-C)*. The RSC-C measures the propensity to
12 rehearse and has been validated in 6-12 year old Chinese children (Ling et al. 2010). The 13-item
13 scale possesses high internal validity ($\alpha = .83$) and satisfactory test-retest reliability within one
14 year ($r = .43$). Each item is rated on a 4-point Likert scale from ‘never’ to ‘all the time’. Example
15 items are ‘If I lose out, I get over it quickly’ and ‘I find myself thinking over and over about
16 things that have made me angry.’ All participants completed the RSC-C before having their
17 anthropometric measurements taken.

18

19 Statistical analyses

20 Descriptive data are presented as means and standard deviations (mean \pm SD). Two
21 forced entry multinomial logistic regression models were computed with body size satisfaction
22 (classified as ‘bigger’, ‘thinner’ or ‘same’, with ‘same’ as the reference category) (model 1) and
23 body size estimation (classified as ‘overestimation’, ‘underestimation’ or ‘accurate estimation’,

1 with ‘accurate estimation’ as the reference category) (model 2) as the respective dependent
2 variables. Gender and body size estimation (for model 1) or body size satisfaction (for model 2)
3 were entered as the predicting variables whereas the continuous variables, BMI and rehearsal,
4 were entered as covariates. A p -value of $< .05$ was set a priori for all analyses.

6 **Results**

7 Perceived and ideal body size ratings, alongside actual body size are provided in Table 1.
8 Mean BMI was 18.52 ± 3.44 (ranging between 12.98 and 33.88). Most boys’ actual body size
9 fell under the 75th percentile for BMI (category 5) and most of their perceived and ideal body
10 size fell under the 25th percentile (category 3). Most girls’ actual body size, perceived and ideal
11 body size fell under the 25th percentile for BMI (category 3).

12
13 --- insert Table 1 here ---

14
15 As for the perceived and ideal body size ratings by gender, only 27% of boys and 26% of
16 girls wanted to maintain their current body size, suggesting that the majority were dissatisfied
17 with their body image. Forty-eight percent of the boys and 55% of the girls preferred to be
18 thinner, while 25% of the boys and 19% of the girls preferred to be bigger. Fifty-eight percent of
19 the boys and 53% of the girls underestimated their size, whereas 17% of the boys and 19% of
20 the girls overestimated their actual body size.

21 Results of the regression analysis for body image satisfaction (model 1) and for body size
22 estimation (model 2) are presented in Table 2. For body image satisfaction (model 1), desire for a
23 ‘bigger’ body size was predicted by lower BMI ($\beta = -.26, p < .05$; adjusted OR: .77, 95%

1 CI: .61, .98). Preferring a ‘thinner’ body size was predicted by higher BMI ($\beta = .65, p < .01$;
2 adjusted OR: 1.91, 95% CI: 1.56, 2.34), an underestimation ($\beta = 1.57, p < .01$; adjusted OR: 4.80,
3 95% CI: 1.91, 12.03) and an overestimation of body size ($\beta = 2.40, p < .01$; adjusted OR: 11.06,
4 95% CI: 2.69, 45.50). However, neither propensity for rehearsal nor gender was a significant
5 predictor of body size satisfaction. Approximately 38% of the variance was explained by the
6 model.

7 For model 2, body size overestimation was predicted by lower BMI ($\beta = -.48, p < .01$;
8 adjusted OR: .62, 95% CI: .46, .83) and body size underestimation was predicted by higher BMI
9 ($\beta = .32, p < .01$; adjusted OR: 1.37, 95% CI: 1.20, 1.57). Moreover, children who
10 underestimated their body size were likely to prefer either a bigger body size ($\beta = 1.15, p < .01$;
11 adjusted OR: 3.15, 95% CI: 1.32, 7.54) or a smaller body size ($\beta = .99, p < .05$; adjusted OR:
12 2.70, 95% CI: 1.25, 5.85). Underestimation of body size was also associated with lower rehearsal
13 tendencies ($\beta = -.06, p < .05$; adjusted OR: .94, 95% CI: .90, .99). Again, no gender differences
14 were found. Approximately 23% of the variance was explained by the model.

15

16

--- insert Table 2 here ---

17

18 **Discussion**

19 To the best of our knowledge, this study is the first to explore body size satisfaction, body
20 size estimation and the propensity for rehearsal in Hong Kong Chinese children. Our results are
21 generally consistent with previous research with the non-clinical children population in that
22 weight status is inversely related the desired body size and children with a lower BMI were more
23 likely to overestimate their this body size and the reverse applies to those with a higher BMI

1 (Kostanski et al, 2004; Kurth and Ellert, 2010). However, contrary to our expectations,
2 propensity for rehearsal was not related to body size satisfaction. Our results show that
3 underestimation of body size was associated with a lower propensity for rehearsal and a higher
4 BMI. This suggests that bigger children may tend to incorrectly perceive themselves as thinner
5 than they are, which may somewhat prevent them from rehearsing about their body size.
6 Alternatively, children with a low propensity for rehearsal may perceive themselves as thinner
7 than they are, and consequently, they might be at greater risk for neglecting their actual body size.
8 The latter could become a health issue if a developmental trend of cardiovascular disease risks is
9 already observed in a child. It is possible that psychological self-regulatory mechanisms other
10 than rehearsal, such as avoidance, are involved in the relationship between weight status and
11 body size overestimation (Schmidt and Treasure 2006; Wendell et al. 2012) and possibly in body
12 image dissatisfaction too (Hughes and Gullone 2011; McLaughlin et al. 2011). In other words,
13 even for a child who may possess a higher tendency to rehearse about his/her body size, the
14 tendency for him/her to avoid addressing these recurrent negative thoughts may moderate the
15 level of dissatisfaction or overestimation towards it. It is also possible that rehearsal does not
16 play as an important role in Chinese children as in their western counterparts as empirical
17 evidence suggests that Chinese children's ideal body image is less extreme relative to their actual
18 body size and obesity seemed to be more acceptable due to the Chinese cultural values (Marsh et
19 al. 2007), thus making a bigger body size, and/or the perception of it, less undesirable and hence
20 less likely to fuel the negative thoughts of it. Nonetheless, and crucially, our findings may
21 suggest that Chinese children's underestimation of their body size could potentially contribute to
22 the upward trend of childhood obesity in Hong Kong. If children are simply unaware that they

1 are becoming overweight, and continue to perceive themselves as smaller than they actually are,
2 excessive weight gain may occur unabated.

3 As for the prevalence of body image dissatisfaction and body size estimation, all results
4 appear to be comparable between boys and girls suggesting that gender differences might not be
5 as prominent for the Chinese children as for children from other cultures (Xanthopoulos et al.
6 2011). Nevertheless, future studies using similar measurements of body size satisfaction and
7 estimation are called for to ascertain this observation.

8 Several limitations of the current study need addressing. Our relatively small sample size
9 limits insight into potential age effects, but age should be considered in future studies given
10 previous that research has suggested that there are changes in body image disturbances across
11 childhood (Gardner et al. 1999). In addition, the CBIS was not developed in Chinese children;
12 however, each photo used in the CBIS corresponds to a known BMI percentile range, originally
13 based on the NCHS 1979 reference data (ranging from the 3rd to the 97th percentile) (Hamill et al.
14 1979), but recently mapped onto the IOTF standards, which includes data for Hong Kong
15 Chinese children (Cole et al. 2000). The use of the CBIS could be further improved if the figures
16 are presented randomly to avoid potential response bias (see Gardner and Brown 2010).

17 To conclude, body image dissatisfaction and misperception can have serious clinical implications
18 for the development of eating pathologies and maladaptive health behaviors, and it is possible
19 that there are weight gain consequences for bigger children who incorrectly perceive themselves
20 as thinner than they are. More research is warranted into the possible psychological mechanisms
21 that create body image disturbances in childhood, particularly in young boys as they seem to be
22 less studied than girls despite that the prevalence of body image dissatisfaction is comparable
23 between the sexes. Educational and health professionals are also strongly encouraged to promote

Running header: Rehearsal, body image and weight status in children

- 1 a better understanding of body image perception in young children both at schools and within the
- 2 community.

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