Investigating the self-stigma and quality of life for

Overweight/obese children in Hong Kong: A preliminary study

Abstract

Overweight (OW) children are likely to internalize common weight bias and developed weight-related self-stigma (or self-stigma in short). Also, OW children tended to have poor health related quality of life (HRQoL) with higher level of self-stigma associated with poorer HRQoL. However, the aforementioned findings have yet been investigated in the East. This study aimed to test the differences of self-stigma and HRQoL between OW and non-OW children, and to examine the correlations between self-stigma and HRQoL in a Hong Kong sample. OW children (n=50, $M_{age} \pm SD = 9.36 \pm 1.17$) and non-OW children ($n$=50, $M_{age} \pm SD = 9.73 \pm 1.28$) completed questionnaires that measure self-stigma (Weight Bias Internalization Scale [WBIS] and Weight Self-Stigma Questionnaire [WSSQ]) and HRQoL (child-reported Kid-KINDL and Sizing Me Up [SMU]). All parents completed parent-reported Kid-KINDL and Sizing Them Up (STU) that measure HRQoL of their children. Compared with non-OW children, OW children had higher self-stigma in WBIS (p=0.003) and WSSQ (p<0.001); lower HRQoL in SMU (p<0.001) and STU (p<0.001). More significant correlations with stronger magnitude (r= -2.83 to -0.61) were shown between self-stigma and HRQoL in OW children than in non-OW children. This study showed that OW children had significantly higher self-stigma and lower HRQoL than did non-OW children in Hong Kong. Moreover, negative correlations between self-stigma and HRQoL were found in OW children. Future study may want to study whether reducing self-stigma of OW children can improve their HRQoL.

1 **1 Introduction**

2   Overweight (OW) and obesity are growing threats to the public health, and the two

3 terms sometimes are used interchangeably because they share the similar concept of excess

4 weight for an individual. Given that excess weight simply reflects on the physiological part,

5 OW (or obesity) share other similar problems in psychological and behavior parts, such as

6 eating disorder behaviors or inappropriate eating patterns (Geliebter and Aversa 2003; Lee et

7 al. 2016). The prevalence of childhood overweight and obesity had increased around the

8 world from 4.2% in 1990 to 6.7% in 2010 (De Onis et al. 2010). Similar phenomenon

9 occurred in Hong Kong: the percentage of childhood overweight and obesity had increased

10 from 16.1 % in 1995/96 to 18.7% in 2014/15 (Centre for Health Protection 2015; The

11 Government of the Hong Kong Special Administrative Region Press Releases 2016). Also,

12 OW children or adolescents in East Asia had an emerging problem in eating disorder: a recent

13 study on mainland Chinese showed that the prevalence of eating disorder was nearly 30%

14 (Feng and Abebe 2017), and a Hong Kong study reported the prevalence of eating disorder

15 around 5% (Tam et al. 2007). In addition to physical (e.g., cardiovascular morbidity) and

16 eating behavior problems (Geliebter and Aversa 2003; Reilly 2005), OW may subsequently

17 bring negative psychosocial issues to children such as depression (Luppino et al. 2010) and

18 lower self-esteem (Pierce and Wardle 1997). Moreover, OW children were found to have

19 weight-related self-stigma (or self-stigma in short) and impaired health-related quality of life

20 (HRQoL; Ciupitu-Plath 2016; Lin et al. 2013).

21   Self-stigma is a kind of self-devaluation among stigmatized people because of their

22 characteristics labeled by the society (Chan et al. 2017; Chang et al. 2016, in press). Taken

23 people with obesity as an example, the society may have incorrect beliefs toward them, such

24 they are lazy and stupid (Puhl and Latner 2007). Furthermore, OW people may receive

25 unfriendly treatment from the society, such as being teased or nicknamed (or even lowered

1   opportunities in getting employment; Flint et al. 2016). The aforementioned attitudes/beliefs

2   and actions/behaviors toward OW people are defined as *stigmatization*. When OW people

3   perceive and endorse the stigmatization, they are likely to self-stigmatize themselves. That is,

4   they will agree with the incorrect beliefs and have emotional distress or withdrawal behaviors

5   (Farhangi et al. 2017). As for children at their middle childhood, some are in puberty (Lee et

6   al. 2017) and may begin to be aware of the body and self-attractiveness. Indeed, a Spanish

7   study surveyed on 944 children aged between 9 and 12 and found that about three fourths of

8   their participants were dissatisfied with their body image and more than half of the

9   participants want to be slimmer (Mendo-Lázaro et al. 2017). Moreover, studies on western

10   children and adolescents indicate that OW and overeating are potential reasons of

11   stigmatization for children; thus, OW children are likely to be bullied (K. Lee et al. 2018; Lin

12   et al. 2018a; Schwimmer et al. 2003). The experience of being bullied may further develop

13   other psychological or behavior problems (Lin and Lin 2017). Therefore, a question arises,

14   "What is the figure of OW and stigmatization in Eastern countries?"

15   The self-stigma issue of OW children should worth an increment in awareness as a

16   study showed that OW individuals had significantly higher self-stigma than non-OW

17   individuals (O'Brien et al. 2016). OW individuals were likely to internalize common weight

18   bias, which included common stereotypes towards OW groups, thereby leading to self-stigma

19   or self-devaluation (Hilbert et al. 2014). The self-devaluation may further trigger a feeling of

20   incompetence, hatred and embarrassment from one's inferior thoughts, and one may regard

21   themselves as the "unwanted" in society (Lillis et al. 2010; Rees 2009; Roberto et al. 2012).

22   Furthermore, studies showed that self-stigma caused maladaptive eating patterns and

23   decreased motivation to control weight (Carels and Latner 2016; Tomiyama 2014). This may

24   result in failure of maintaining or losing weight, and subsequently develop a vicious cycle of

25   being OW.

1   In addition to the impact of self-stigma, we should be aware of OW children's HRQoL

2   because it is a holistic concept of health status, including physical, emotional, mental, social,

3   behavioral well-being and function (Ciupitu-Plath 2016). Based on the definition proposed by

4   the World Health Organization (1993, p153), HRQoL indicates "an individual's perception of

5   their position in life in the context of the culture and value systems in which they live and in

6   relation to their goals, expectations, standards and concerns." Hence, HRQoL is a kind of self-

7   perceived health status of a person and is viewed as important health-related outcomes

8   (Huang et al. 2018).

9   Given the importance of HRQoL, studies have explored the HRQoL for OW children

10   though many of them were conducted in the West (e.g., Schwimmer et al. 2003; Shoup et al.

11   2008; Williams et al. 2005), and consistent results indicate the impairment of HRQoL among

12   OW children. Specifically, OW children had similar HRQoL scores to children with chronic

13   diseases (e.g., cancer, diabetes, asthma, atopic dermatitis and inflammatory bowel disease)

14   that required intensive medical care (Faus et al. 2015). Recently, Lin and his colleagues have

15   conducted a series of studies on assessing HRQoL among OW children (Lin et al. 2012, 2013,

16   2018b; C.-T. Lee et al. 2018; Miri et al. 2017; Strong et al. 2017; Su et al. 2013), and they

17   reported that OW children had remarkably lower physical and psychosocial HRQoL scores

18   than their normal-weight counterparts.

19   Some researchers suggested that higher level of self-stigma was associated with

20   poorer HRQoL. Latner et al. (2013, 2014) discovered that there were negative associations

21   between self-stigma and HRQoL on physical and mental functioning among OW adults.

22   Similarly, a study disclosed that self-stigma was significantly and positively related to

23   greater emotional problems in both OW and non-OW children, given that the relationship

24   was slightly stronger in the OW children (Zuba and Warschburger 2017). These findings

1   revealed the insights that OW population who have self-stigma may tend to have poorer

2   HRQoL.

3   However, to the best of our knowledge, no studies have investigated the self-

4   stigma, and its relationship with HRQoL among Eastern OW children. Given the cultural

5   differences between the East Asia and the West, there is a need to probe the

6   aforementioned issue in an East sample. Specifically, Lee et al. (1993) described that

7   traditional Chinese has regarded fatness as beauty, wealth and fertility for females. In

8   addition, a common Chinese saying *xin guang ti pan* (n.d.) indicates that people would

9   gain weight when they are relaxed. There are also other Chinese proverbs appreciate

10   fatness (e.g., getting fat equals to getting rich; laugh and grow fat). Hence, fat seems to be

11   a virtue under Chinese culture. On the contrary, the Western society believes that thinness

12   is equivalent to physical attractiveness, success and happiness (Vogt Yuan 2010).

13   Moreover, as American students compared their weight status to their generally-OW peers,

14   OW American students had lower chance to recognize themselves as "fat" when compared

15   to the Chinese students (Zhang et al. 2011).

16   However, empirical studies showed that westernized Asia regions, such as Hong

17   Kong, adopt the concept of slim persons as beautiful (Lee et al. 1996; Wong and Huang

18   1999) and the concept contradicts the popular Chinese belief that plumpness is attractive

19   body feature in women. Specifically, a study on Hong Kong Beauty Pageant contestants

20   showed a downward trend in the weight status (Leung et al. 2001). Moreover, the winners

21   were all slimmer than average women in Hong Kong, which indicates the different beauty

22   standards for men and women. Women are expected to have a narrow waist set against full

23   hips (Leung et al. 2001).

24   A research gap was identified that no self-stigma information for East Asian children

25   was found, we would like to explore the following aims in a Hong Kong sample: (1) to test

1 the difference of self-stigma between OW and non-OW children, (2) to investigate difference

2 of HRQoL between OW and non-OW children, and (3) to examine the correlations between

3 self-stigma and HRQoL for OW and non-OW children separately.

4   Based on our study aims, we proposed the following hypotheses: (1) OW children as

5 compared with non-OW children had higher level of self-stigma, (2) OW children as

6 compared with non-OW children had poorer HRQoL in all domains, and (3) self-stigma

7 would correlate to HRQoL for both OW and non-OW children; however, the correlations

8 between self-stigma and HRQoL would be stronger in the OW children than those in non-OW

9 children. Given that we measured HRQoL using two types of questionnaire (one is generic

10 HRQoL instrument, and the other is weight-related HRQoL instrument), we further

11 hypothesized that the relationship between self-stigma and weight-related HRQoL would be

12 stronger than the relationship between self-stigma and generic HRQoL.

13 **2 Methods**

14 **2.1 Participants and procedures**

15   The approval of the study proposal was obtained from the Human Subjects Ethic

16 Review Board (HSEARS20160824003), The Hong Kong Polytechnic University before data

17 collection. We recruited participants through convenience sampling, and 124 dyads of

18 children and their primary caregivers (most of them were parents) participated in the study.

19 Moreover, we used body mass index (BMI) to classify the children into an OW or a non-OW

20 group based on Hong Kong norm (Table 1; detailed information *cf.* So et. al 2008). The first

21 50 recruitments of each groups were chosen as the final participants, in order to have the

22 sample size of $n=100$. The inclusion criteria were children who: (1) are aged between 8 and

23 12 years old; (2) had the ability to understand written or spoken Cantonese; (3) were studying

24 in Hong Kong; (4) voluntarily agree to participate in this study, together with their caregivers.

25 The exclusion criteria were children who are diagnosed with: (1) cognitive impairment; (2)

1   neurological diseases, such as autism spectrum disorder, attention-deficit/hyperactivity

2   disorder, and intellectual disability; (3) any physical disability such as amputation and

3   wheelchair-bond.

4   (Insert Table 1 here)

5   All the participants were first informed of the study purpose and detailed information.

6   Study procedure was presented to those who showed interests. After the participants had fully

7   understood the study, the parents signed a written informed consent if they and their children

8   were willing to participate. Afterward, the parents completed a background information sheet

9   and two questionnaires regarding HRQoL of their children, while their children completed

10 two child-reported HRQoL questionnaires and two self-stigma scales. We ensured that there

11 was no interaction or discussion when the primary caregivers and children were completing

12 the questionnaires.

13 **2.2 Instrument**

14 **Kid-KINDL**

15   The Kid-KINDL, a generic HRQoL instrument for 8- to 12-year-old children, includes

16 paralleled children self-report and parent-proxy report. The Kid-KINDL consists of 24 items

17 of six domains (each domain has four items): physical well-being, emotional well-being, self-

18 esteem, family, friends, and school functioning. All the items were rated on a 5-point Likert

19 scale ranging from 1 (*never*) to 5 (*all the time*). The Likert scale was then linearly transformed

20 to a 0-100 scale. A higher level of HRQoL was indicated by a higher score (Ravens-Sieberer

21 and Bullinger 2000).

22   The Kid-KINDL had a high internal consistency ($\alpha = 0.63$ to 0.76 for child-rated

23 reports; 0.62 to 0.81 for parent-rated reports). The convergent validity was also supported for

24 Kid-KINDL: it was highly correlated with other HRQoL measures ($r=0.64$ to 0.72; Ravens-

25 Sieberer and Bullinger 2000). The content validity and known-group validity were supported

1　in both child- and parent-reported Hong Kong version of Kid-KINDL; their internal

2　consistency was also satisfactory (α for both child- and parent-reports=0.77; Chan et al.

3　2014).

4　**Sizing Me Up (SMU) and Sizing Them up (STU)**

5　　　SMU and STU measure weight-related HRQoL for children using a specific item

6　stem: "…because of my weight/size/shape". SMU is a child-rated questionnaire and STU is a

7　parent-proxy measure. Both questionnaires can be used for children aged between 8 and 12.

8　SMU consists of 22 items with five scales: emotional (4 items), physical (5 items), teasing/

9　marginalization (2 items), positive attributes (6 items) and social avoidance (5items); STU

10　contains of 22 items with six scales: emotional (7 items), physical (5 items), teasing/

11　marginalization (3 items), positive attributes (4 items), mealtime (2 items) and school (1

12　items). All items were rated on a 4-point Likert scale, ranging from 1 (*none* or *never*) to 4 (*all*

13　*of the times* or *always*), and the scores were converted into a 0-100 scale. A better weight-

14　related HRQoL was indicated by a higher score (Modi and Zeller 2008; Zeller and Modi

15　2009).

16　　　Both questionnaires demonstrated acceptable internal consistency (α = 0.68 to 0. 85

17　for SMU; = 0.59 to 0.91 for STU) and good test-retest reliability (ICCs = 0.53 to 0.78 for

18　child-rated reports; 0.57 to 0.80 for parent-rated reports; Modi and Zeller 2008; Zeller and

19　Modi 2009). The convergent validity was also supported: other HRQoL instruments were

20　correlated to SMU (*r*=0.35 to 0.65; Zeller and Modi 2009) and STU (*r*=0.31 to 0.73; Modi

21　and Zeller 2008). In addition, both SMU and STU Chinese versions have good internal

22　consistency (α = 0.62 to 0.88 in SMU; 0.56 to 0.77 in STU; Lin et al. 2018b; Strong et al.

23　2017)

24　**Weight bias internalization scale (WBIS)**

25　　　The WBIS measures weight-related self-stigma, and we used a standardized procedure

1 (including forward and back translations, and reconciliation) to translate the WBIS into

2 Chinese. During the translation, we adopted a neutral way to present the weight status (e.g.,

3 we use "because of your weight" instead of "because of your excess weight") after discussing

4 with the developer (Prof. Janet D Latner) to enhance the feasibility of the WBIS. Therefore,

5 the linguistic validity of the scale is ensured. The WBIS has 11 items (Durso and Latner

6 2008), and all items were rated on a 5-point Likert scale from 1 (*strongly disagree*) to 5

7 (*strongly agree*). Moreover, the higher the total score, the higher the level of weight-related

8 self-stigma is. The WBIS (English version) had high internal consistency ($\alpha = 0.90$) and

9 acceptable construct validity (Hilbert et al. 2014).

10 **Weight self-stigma Questionnaire (WSSQ)**

11   The WSSQ also investigates the weight-related self-stigma (Lillis et al. 2010) and it

12 consists of 12 items to measure self-stigma in two domains: self-devaluation (or self-stigma;

13 the first 6 items) and fear of enacted stigma (or perceived stigma; the last 6 items). Since we

14 only focused on self-stigma, we only used the first six items, which are about self-

15 devaluation. Each item was rated on a 5-point Likert scale from 1 (*strongly disagree*) to 5

16 (*strongly agree*), and the higher the total score, the higher level of self-stigma is. The WSSQ

17 has been translated into a Chinese version with acceptable internal consistency ($\alpha = 0.78$ for

18 self-devaluation subscale) and adequate test-retest reliability ($r=0.86$; Lin and Lee 2017).

19 *Statistical analysis*

20   Independent t tests were then conducted to test the weight-related self-stigma and

21 HRQoL differences for normally distributed data; Mann-Whitney U test for non-normal

22 distributed data. In addition, Pearson correlation coefficients (for normally distributed data)

23 and Spearman's rho tests (for non-normal distributed data) were used to examine the

24 correlations between HRQoL and self-stigma for both groups separately. After testing the

25 correlation, we constructed several regression models to understand how self-stigma predicted

1   HRQoL among OW children. Specifically, we used those child-reported HRQoL domains (or

2   total score) that are significantly correlated with WBIS or WSSQ score as dependent

3   variables; WBIS or WSSQ scores as independent variable (the two scores were constructed

4   into different regression models); age, gender, and with (or without) chronic illness as

5   controlling variables.

6

7   **3 Results**

8   Table 1 demonstrates the demographics of the participants. Around 60% were males in

9   both group, and most of the children (94%) did not have any chronic illness.

10   (Insert Table 2 here)

11

12   **3.1 Comparisons of self-stigma and HRQoL between two groups**

13   The OW group had significantly higher self-stigma scores than the non-OW group in

14   both WBIS (26.60±9.56 *vs.* 21.52±7.19, *p*=0.003) and WSSQ (14.50±4.89 *vs.* 11.02±4.37,

15   *p*<0.001). Moreover, the OW group had SMU scores significantly lower than the non-OW

16   group in emotional, physical and positive attributes domain scores, and the total score. The

17   OW group had STU scores significantly lower than did the non-OW group in emotional,

18   physical, teasing/marginalization and school domain scores, and the total score. However,

19   there were no significant differences between the two groups in both child-related and parent-

20   related Kid-KINDLs (Table 3).

21   (Insert Table 3 here)

22   **3.2 Correlations between self-stigma and HRQoL in OW group**

23   In the OW group, WBIS was significantly (or marginally significantly) and negatively

24   correlated with both child-rated (*r*= -0.54 to -0.24) and parent-rated Kid-KINDLs (*r*= -0.54 to

25   -0.26), except for self-esteem and school domains. WBIS was significantly and negatively

1   correlated with all the domain scores and the total score of SMU (r= -0.35 to -0.61, p<0.05),

2   except for positive attributes domain. In addition, WBIS was significantly and negatively

3   correlated with the mealtime domain (r= -0.30) and the total score of STU (r= -0.34). For

4   WSSQ, it was significantly and negatively correlated with physical domain in child-rated Kid-

5   KINDL (r= -0.43); and with physical domain (r= -0.54), self-esteem domain (r= -0.31) and

6   the total score (r= -0.38) in parent-rated Kid-KINDL. WSSQ was also significantly and

7   negatively correlated with SMU (r=-0.46 to -0.32), except for teasing/marginalization and

8   positive attribute domains. Furthermore, WSSQ was significantly and negatively correlated

9   with physical domain (r= -0.28), positive attributes domain (r= -0.33) and the total score of

10   STU (r= -0.33; Table 4).

11   (Insert Table 4 here)

12   **3.3 Correlations between self-stigma and HRQoL in non-OW group**

13   In the non-OW group, WBIS was significantly and negatively correlated with the

14   child-rated Kid-KINDL in the family domain (r= -0.36) and the total score (r= -0.31,

15   p=0.030), but not correlated with parent-rated Kid-KINDL. WBIS was significantly and

16   negatively correlated with all the domain scores and the total score of SMU (r= -0.31 to -

17   0.45), except for positive attributes domain; WBIS was not significantly correlated with all

18   the domains scores and the total score of STU, except for physical domain (r= -0.35).

19   Moreover, WSSQ was not significantly correlated with all the HRQoL questionnaires except

20   for the physical domain in STU (r= -0.32; Table 5).

21   (Insert Table 5 here)

22   **3.4 Association between self-stigma and HRQoL in OW group using regression models**

23   After controlling for several confounders (age, gender, and with or without chronic

24   illness), our regression models showed similar results to the correlation findings. Self-stigma

25   measures using WBIS and WSSQ was negatively and significantly correlated to child-rated

1   HRQoL in total score, physical, emotional, family, teasing/marginalization, and social

2   avoidance domains. In addition, the correlations between SMU and self-stigma were stronger

3   than those between child-related Kid-KINDL and self-stigma (Table 6).

4   (Insert Table 6 here)

5

6   **5 Discussion**

7   Most studies regarding health-related problems arisen from self-stigma in OW

8   children were from the West (e.g., Hilbert et al. 2014; Lillis et al. 2010; O'Brien et al.

9   2016; Rees et al. 2009; Roberto et al. 2012). Our findings extended the current literature to

10 the understanding of this area in an Eastern context.

11   In terms of our first hypothesis, we examined the differences in HRQoL between

12 OW and non-OW children. Our findings are in line with a western study (O'Brien et al.

13 2016) that self-stigma was significantly higher in OW group than non-OW group. Self-

14 stigma often arises from unfriendly environment, including weight-based mistreatment,

15 social devaluation and negative stereotype. As OW individuals are more likely to

16 internalize these stigmatizations, they may endorse the same negative discrimination

17 against themselves, resulting in self-stigma (Major et al. 2017). The aforementioned

18 mechanism somewhat explains our results that the level of self-stigma of OW children was

19 higher than that of non-OW children in Hong Kong. Moreover, the OW children are more

20 likely to be treated as having lower athletic, academic, artistic and social ability (Penny

21 and Haddock 2007). These negative expectations from the environment might also be

22 internalized as self-stigma, as shown in our OW children.

23   For the second hypothesis, we examined the difference in HRQoL between OW

24 and non-OW children and found that HRQoL (measured by both SMU and STU) were

25 significantly lower in the OW group as compared with non-OW group. The finding is

1   consistent with previous studies exploring HRQoL in OW children (Chen et al. 2015; Lin

2   et al. 2013; Wallander et al. 2009). Among various domains in both SMU and STU, the

3   largest differences between the two groups of children were the physical and emotional

4   domains of HRQoL. Kolotkin et al. (2006) explained the reasons of these differences. For

5   physical domain, OW children may encounter difficulties in fitting into seats, bending

6   over, climbing stairs, or crossing legs and these barriers may highly lower their perception

7   on own physical health. For emotional domain, evidence showed that OW may lead to

8   decrease in children's self-esteem and increase in risk of developing depression. Pierce and

9   Wardle (1997) found that OW children might believe that being OW would affect their

10   social status among their peers, and thus they would have poorer self-esteem. In addition,

11   Luppino et al. (2010) observed that OW might increase one's inflammation responses and

12   disturb one's stress system. These physiological responses correlate with depression.

13   However, it is noteworthy that there were no significant differences between OW

14   group and non-OW group in generic HRQoL (measured by both child-rated Kid-KINDL

15   and parent-rated KINDL). This contradiction with the previously-stated results with

16   weight-related HRQoL may due to two possible reasons. Lin et al. (2013) found that

17   decrease in general HRQoL was only found in OW children with BMI higher than 95th

18   percentile but not in those with BMI between 85-95th percentile. However, we did not

19   specifically classify our participants between 85-95th and 95th percentiles in this study.

20   Another possible reason is that Kid-KINDL is an instrument that measures generic HRQoL

21   (Ravens-Sieberer and Bullinger 2000), whereas SMU and STU are weight-specific

22   questionnaires that give more precise reflection on how weight affects HRQoL of OW

23   children (Modi and Zeller 2008; Zeller and Modi 2009). Therefore, the Kid-KINDL as

24   compared with SMU and STU might not have the sensitivity to detect the impaired

25   HRQoL difference in our OW group, which might be near 85-95th percentile. Indeed,

1   Strong et al. (2017) found that SMU had higher correlation with BMI as compared with

2   another generic HRQoL instrument. As a result, we suggested using weight-specific

3   HRQoL questionnaires as they are more sensitive than generic QoL to find out HRQoL

4   problems OW children may encounter.

5   For the third hypothesis, we compared the correlations of self-stigma and HRQoL

6   between OW and non-OW children. Our findings indicated that more number of

7   significant negative correlations with stronger magnitude (r= -2.83 to -0.61) between self-

8   stigma and total scores of all HRQoL questionnaires in the OW group than in the non-OW

9   group. A Western study showed that the positive correlation between child-rated self-

10   stigma and emotional problems was slightly stronger in the OW children as compared with

11   the non-OW children (r=0.19 for non-OW group, r= 0.22 for OW group; Zuba and

12   Warschburger 2017). Our study extended the findings from emotional problems to

13   emotional functioning in HRQoL (r= -0.44 for non-OW group, r= -0.61 for OW group).

14   Also, our study extended the knowledge from the West to the East that OW children who

15   had lower self-stigma in Hong Kong might have poorer HRQoL.

16   Followed by our third hypothesis, we examined the associations between self-

17   stigma and two types of HRQoL measures in the OW group. The results indicated that

18   self-stigma was negatively associated with both generic HRQoL and weight-related

19   HRQoL (SMU scores, especially in physical and psychosocial domains), and the findings

20   aligned with those of Latner et al. (2013, 2014) on OW adults: a higher level of self-stigma

21   is associated with poorer physical and mental HRQoL among OW adults. Because stress

22   from self-stigma may affect cardiovascular and metabolic health (Puhl and Latner 2007)

23   and self-stigma was associated with lower exercise motivation (Pearl et al. 2015), self-

24   stigma is negatively correlated with physical HRQoL. In addition, higher level of self-

25   stigma was associated with greater psychological distress (O'Brien et al. 2016), lower self-

1 esteem (Pearl and Puhl 2016) and the presence of shame (Palmeira et al. 2016), which

2 somewhat explained the correlation between self-stigma and psychosocial HRQoL.

3   Interestingly, child- and parent-rated HRQoL questionnaires had inconsistency

4 correlations with self-stigma. Specifically, the significant correlations found in child-rated

5 HRQoL questionnaire were not found in parent-rated HRQoL questionnaire. As parents of

6 OW children recruited from the community tended to overestimate HRQoL of their

7 children (Cheng et al. 2016; Su et al. 2013), we postulated that the parents of OW children

8 in community were not aware of OW-related problems of their children, or they perceived

9 their children as having normal weight (Lin et al. 2013). As a result, we might not find

10 significant correlation between self-stigma and parent-rated HRQoL.

11   Another interesting finding was that two measures of self-stigma, WBIS and

12 WSSQ, shared similar relationships with HRQoL in the OW group, but not in the non-OW

13 group. For example, in non-OW group, there were significant associations between WBIS

14 and all domains of SMU (except positive attribute), but none was found between WSSQ

15 and SMU. This inconsistency may be explained by the different terms regarding weight

16 used in the WBIS and WSSQ: our WBIS used neutral wordings to describe the weight-

17 related items (e.g., "*I feel anxious about my weight" (instead of full sentence being*

18 *overweight in English version) because of what people might think of me*"); our WSSQ

19 directly describes the term of overweight (e.g., "*I'll always go back to being overweight*".

20 In this sense, WSSQ might not be a sensitive instrument to measure the level of self-stigma

21 for non-OW children.

22 **5.1 Limitation**

23   This study has several limitations. First, our exclusion criteria for participation did not

24 include the diagnosis of mental illnesses. Previous research stated that OW children were

25 prone to have mental health comorbidities (Morrison et al. 2015), while level of anxiety and

1   depression were significant predictors of HRQoL (Stevanovic 2013). Thus, it is uncertain

2   whether the underlying psychological problems of our participants may account for the

3   significant difference in HRQoL and relationship between self-stigma and HRQoL among

4   OW children in our findings. Second, as the weight and height of some children were reported

5   by parents, it may affect its reliability and further studies should apply objective measurement

6   when collecting BMI data. Third, we cannot determine whether it is a causal relationship

7   between self-stigma and HRQoL by our cross-sectional design, and thereby prospective

8   longitudinal research is recommended to explore the relative change of HRQoL to the change

9   of self-stigma. Fourth, given the nature of convenience sampling in a relatively small and

10   homogeneous sample, in which nearly 60% of them were recruited from the same NGO, the

11   generalizability of the results is restricted. Additional study should recruit a larger sample

12   from different areas of Hong Kong.

13   **5.2 Implications and directions for future studies**

14   The results provide health professionals, counselor, and educators with an increased

15   understanding of higher possibility of forming self-stigma for overweight children and how

16   self-stigma were related to lower levels of HRQoL among children in Hong Kong. This

17   information is critical to enhance professionals' clinical skills when working with overweight

18   children. Having an understanding of these relationships between self-stigma and HRQoL

19   will assist professionals in being more responsive to the needs of overweight children in both

20   physical and psychological aspects. In addition, children should be educated regarding self-

21   stigma to enhance awareness about its impact on their quality of life, as well as the associated

22   physical and psychological problems that can occur. Children may be well aware of the

23   problems of overweight, but they might not have insight about how overweight were related

24   to self-stigma and how it impacted on their HRQoL.

25   This article provides preliminary and initial information regarding self-stigma and

1   HRQoL; however, future study is needed to examine psychological problems simultaneously

2   with self-stigma when studying OW children's HRQoL, given that OW children are prone to

3   have mental health comorbidities. In addition, future study can further identify protective

4   factors that moderate the relationships between overweight and self-stigma as well as the link

5   between self-stigma and HRQoL, in order to develop intervention programs accordingly for

6   OW children.

References

Carels, R. A., & Latner, J. (2016). Weight stigma and eating behaviors. An introduction to the special issue. *Appetite*, *102*, 1-2. https://doi.org/10.1016/j.appet.2016.03.001

Centre for Health Protection. (2015). Healthy weight healthy kids. *NCD Watch*. http://www.chp.gov.hk/files/pdf/ncd_watch_mar2015.pdf. Accessed 1 December 2017.

Census and Statistic Department. (2017). Table E032: Domestic households by household size and monthly household income. http://www.censtatd.gov.hk/fd.jsp?file=D5250036E2017QQ02E.xls&product_id=D525 0036&lang=1. Accessed 1 December 2017.

Chan, P. L., Ng, S. S., & Chan, D. Y. (2014). Psychometric properties of the Chinese version of the Kid-KINDL-R questionnaire for measuring the health-related quality of life of school-aged children. *Hong Kong Journal of Occupational Therapy, 24*(1), 28-34. https://doi.org/10.1016/j.hkjot.2014.05.001

Chan, Y., Chan, Y. Y., Cheng, S. L., Chow, M. Y., Tsang, Y. W., Lee, C., et al. (2017). Investigating quality of life and self-stigma in Hong Kong children with specific learning disabilities. *Research in Developmental Disabilities, 68*, 131-139. http://dx.doi.org/10.1016/j.ridd.2017.07.014

Chang, C.-C., Lin, C.-Y., Gronholm, P. C., & Wu, T.-H. (in press). Cross-validation of two commonly used self-stigma measures, Taiwan versions of the Internalized Stigma Mental Illness scale and Self-Stigma Scale-Short, for people with mental illness. *Assessment*. https://doi.org/10.1177/1073191116658547

Chang, C.-C., Wu, T.-H., Chen, C.-Y., & Lin, C.-Y. (2016). Comparing internalized stigma between people with different mental disorders in Taiwan. *Journal of Nervous & Mental Disease, 204*(7), 547-553.

Chen, Y. P., Wang, H. M., Edwards, T. C., Wang, T., Jiang, X. Y., Lv, Y. R., et al. (2015).
Factors influencing quality of life of obese students in Hangzhou, China. *PLoS one,
10*(3), e0121144. https://doi.org/10.1371/journal.pone.0121144

Cheng, C. P., Luh, W. M., Yang, A. L., Su, C. T., & Lin, C. Y. (2016). Agreement of
children and parents scores on Chinese version of Pediatric Quality of Life Inventory
Version 4.0: Further psychometric development. *Applied Research in Quality of Life*,
11(3), 891-906.

Ciupitu-Plath, C. (2016). *Weight stigma experiences and internalization among boys and
girls accessing obesity care in Berlin, Germany* (Doctoral thesis, Technical University
of Berlin). https://doi.org/10.14279/depositonce-4998

Davison, K. K., Schmalz, D. L., Young, L. M., & Birch, L. L. (2008). Overweight girls who
internalize fat stereotypes report low psychosocial well-being. *Obesity*, *16*(S2), S30-S38.
https://doi.org/10.1038/oby.2008.451

De Onis, M., Blössner, M., & Borghi, E. (2010). Global prevalence and trends of overweight
and obesity among preschool children. *The American Journal of Clinical Nutrition*,
92(5), 1257-1264. https://doi.org/10.3945/ajcn.2010.29786

Durso, L. E., & Latner, J. D. (2008). Understanding self-directed stigma: Development of the
Weight Bias Internalization Scale. *Obesity*, *16*(S2), S80-S86.
https://doi.org/10.1038/oby.2008.448

Farhangi, M. A., Emam-Alizadeh, M., Hamedi, F., & Jahangiry, L. (2017). Weight self-
stigma and its association with quality of life and psychological distress among
overweight and obese women. *Eating and Weight Disorders: EWD, 22*(3), 451-456.

Faus, A. L., Turchi, R. M., Polansky, M., Berez, A., & Leibowitz, K. L. (2015). Health-
related quality of life in overweight/obese children compared with children with
inflammatory bowel disease. *Clinical Pediatrics*, *54*(8), 775-782.
https://doi.org/10.1177/0009922814562555

Feng, T., & Abebe, D. S. (2017). Eating behaviour disorders among adolescents in a middle school in Dongfanghong, China. *Journal of Eating Disorders, 5*, 47.

Flint, S. W., Čadek, M., Codreanu, S. C., Ivić, V., Zomer, C., & Gomoiu, A. (2016). Obesity Discrimination in the Recruitment Process: "You're Not Hired!" *Frontiers in Psychology, 7*, 647. http://doi.org/10.3389/fpsyg.2016.00647

Geliebter, A., & Aversa, A. (2003). Emotional eating in overweight, normal weight, and underweight individuals. *Eating Behaviors, 3*, 341-347.

Hilbert, A., Baldofski, S., Zenger, M., Löwe, B., Kersting, A., & Braehler, E. (2014). Weight Bias Internalization Scale: Psychometric properties and population norms. *PLoS One*, *9*(1), e86303. https://doi.org/10.1371/journal.pone.0086303

Huang, W.-Y., Chen, S.-P., Pakpour, A. H., & Lin, C.-Y. (2018). The mediation role of self-esteem for self-stigma on quality of life for people with schizophrenia: A retrospectively longitudinal study. *Journal of Pacific Rim Psychology, 12*(e10), 1-7.

Kolotkin, R. L., Zeller, M., Modi, A. C., Samsa, G. P., Quinlan, N. P., Yanovski, J. A., et al. (2006). Assessing weight-related quality of life in adolescents. *Obesity*, *14*(3), 448-457.

Latner, J. D., Barile, J. P., Durso, L. E., & O'Brien, K. S. (2014). Weight and health-related quality of life: The moderating role of weight discrimination and internalized weight bias. *Eating Behaviors*, *15*(4), 586-590.

Latner, J. D., Durso, L. E., & Mond, J. M. (2013). Health and health-related quality of life among treatment-seeking overweight and obese adults: Associations with internalized weight bias. *Journal of Eating Disorders*, *1*(1), 3.

Lee, C.-T., Lin, C.-Y., Strong, C., Lin, Y.-F., Chou, Y.-Y., & Tsai, M.-C. (2018). Metabolic correlates of health-related quality of life among Taiwanese overweight and obese adolescents. *BMC Pediatrics, 18*, 25.

Lee, C.-T., Tsai, M.-C., Lin, C.-Y., & Strong, C. (2017). Longitudinal effects of self-report pubertal timing and menarcheal age on adolescent psychological and behavioral

outcomes in female youths from Northern Taiwan. *Pediatrics & Neonatology, 58*, 313-320. https://doi.org/10.1016/j.pedneo.2016.04.004.

Lee, J. S., Mishra, G., Hayashi, K., Watanabe, E., Mori, K., & Kawakubo, K. (2016). Combined eating behaviors and overweight: Eating quickly, late evening meals, and skipping breakfast. *Eating Behaviors, 21*, 84-88. https://doi.org/10.1016/j.eatbeh.2016.01.009.

Lee, K., Dale, J., Guy, A., & Wolke, D. (2018). Bullying and negative appearance feedback among adolescents: Is it objective or misperceived weight that matters? *Journal of Adolescence, 63*, 118-128. https://doi.org/10.1016/j.adolescence.2017.12.008.

Lee, S., Ho, T. P., & Hsu, L. K. G. (1993). Fat phobic and non-fat phobic anorexia nervosa: a comparative study of 70 Chinese patients in Hong Kong. *Psychological Medicine*, *23*(4), 999-1017. https://doi.org/10.1017/S0033291700026465

Lee, S., Leung, T., Lee, A. M., Yu, H., & Leung, C. M. (1996). Body dissatisfaction among Chinese undergraduates and its implications for eating disorders in Hong Kong. *International Journal of Eating Disorders, 20*(1), 77-84.

Leung, F., Lam, S., & Sze, S. (2001). Cultural expectations of thinness in Chinese women. *Eating Disorders, 9*(4), 339-350.

Lillis, J., Luoma, J. B., Levin, M. E., & Hayes, S. C. (2010). Measuring weight self-stigma: The weight self-stigma questionnaire. *Obesity*, *18*(5), 971-976. https://doi.org/10.1038/oby.2009.353

Lin, C.-Y., Su, C.-T., & Ma, H.-I. (2012). Physical activity patterns and quality of life of overweight boys: A preliminary study. *Hong Kong Journal of Occupational Therapy, 22*(1), 31-37.

Lin, C.-Y., Su, C.-T., Wang, J.-D., & Ma, H.-I. (2013). Self-rated and parent-rated quality of life (QoL) for community-based obese and overweight children. *Acta Paediatrica*, *102*(3), e114-e119. https://doi.org/10.1111/apa.12108

Lin, K., & Lee, M. (2017). Validating a Chinese version of the Weight Self-stigma Questionnaire for use with obese adults. *International Journal of Nursing Practice, 23*(4), e12537. https://doi.org/10.1111/ijn.12537

Lin, Y.-C., Latner, J. D., Fung, X. C. C., & Lin, C.-Y. (2018a). Poor health and experiences of being bullied in adolescents: Self-perceived overweight and frustration with appearance matter. *Obesity, 26*(2), 397-404. https://doi.org/10.1002/oby.22041.

Lin, Y.-C., & Lin, C.-Y. (2017). Minor symptoms talk: How children react to encountered bullying. *Child Indicators Research*. https://doi.org/10.1007/s12187-017-9505-4

Lin, Y.-C., Strong, C., Tsai, M.-C., Lin, C.-Y., & Fung, X. C. C. (2018b). Validating Sizing Them Up, a parent-proxy weight-related quality-of-life measure, with community-based children. *International Journal of Clinical & Health Psychology, 18*(1), 81-89. https://doi.org/10.1016/j.ijchp.2017.10.001

Luppino, F. S., de Wit, L. M., Bouvy, P. F., Stijnen, T., Cuijpers, P., Penninx, B. W., et al. (2010). Overweight, obesity, and depression: A systematic review and meta-analysis of longitudinal studies. *Archives of General Psychiatry*, *67*(3), 220-229.

Major, B., Tomiyama, A. J., & Hunger, J. M. (2017). The Negative and Bi-Directional Effects of Weight Stigma on Health. In B. Major, J. Dovidio & B.G. Link (Eds.), *Oxford Handbook of Stigma, Discrimination and Health* (pp. 499-520). New York, NY: Oxford University Press.

Mendo-Lázaro, S., Polo-del-Río, M. I., Amado-Alonso, D., Iglesias-Gallego, D., & León-del-Barco, B. (2017). Self-concept in childhood: The role of body image and sport practice. *Frontiers in Psychology, 8*, 853. http://doi.org/10.3389/fpsyg.2017.00853

Miri, S. F., Javadi, M., Lin, C.-Y., Irandoost, K., Rezazadeh, A., & Pakpour, A. H. (2017). Health related quality of life and Weight Self-Efficacy of Life style among normal-weight, overweight and obese Iranian adolescents: a case control study. *International Journal of Pediatrics, 5*(11), 5975-5984.

Modi, A. C., & Zeller, M. H. (2008). Validation of a parent-proxy, obesity-specific quality-of-life measure: Sizing them up. *Obesity*, *16*(12), 2624-2633. https://doi.org/10.1038/oby.2008.416

Morrison, K. M., Shin, S., Tarnopolsky, M., & Taylor, V. H. (2015). Association of depression & health related quality of life with body composition in children and youth with obesity. *Journal of Affective Disorders, 172*, 18-23. https://doi.org/10.1016/j.jad.2014.09.014

O'Brien, K. S., Latner, J. D., Puhl, R. M., Vartanian, L. R., Giles, C., Griva, K., et al. (2016). The relationship between weight stigma and eating behavior is explained by weight bias internalization and psychological distress. *Appetite*, *102*, 70-76. https://doi.org/10.1016/j.appet.2016.02.032

Palmeira, L., Pinto-Gouveia, J., & Cunha, M. (2016). The role of weight self-stigma on the quality of life of women with overweight and obesity: A multi-group comparison between binge eaters and non-binge eaters. *Appetite*, *105*, 782-789. https://doi.org/10.1016/j.appet.2016.07.015

Pearl, R. L., & Puhl, R. M. (2016). The distinct effects of internalizing weight bias: An experimental study. *Body Image*, *17*, 38-42. https://doi.org/10.1016/j.bodyim.2016.02.002

Pearl, R. L., Puhl, R. M., & Dovidio, J. F. (2015). Differential effects of weight bias experiences and internalization on exercise among women with overweight and obesity. *Journal of Health Psychology*, *20*(12), 1626-1632. https://doi.org/10.1177/1359105313520338

Penny, H., & Haddock, G. (2007). Children's stereotypes of overweight children. *British Journal of Developmental Psychology*, *25*(3), 409-418. https://doi.org/10.1348/026151006X158807

Pierce, J. W., & Wardle, J. (1997). Cause and effect beliefs and self-esteem of overweight

    children. *Journal of Child Psychology and Psychiatry*, *38*(6), 645-650.

    https://doi.org/10.1111/j.1469-7610.1997.tb01691.x

Puhl, R. M., & Latner, J. D. (2007). Stigma, obesity, and the health of the nation's children.

    Psychological Bulletin, *133*(4), 557. https://doi.org/10.1037/0033-2909.133.4.557

Ravens-Sieberer, U., & Bullinger, M. (2000). *KINDL^R questionnaire for measuring health-*

    related quality of life in children and adolescents revised version manual.

    http://www.kindl.org/english/manual/. Accessed 1 December 2017.

Rees, R., Oliver, K., Woodman, J., & Thomas, J. (2009). Children's view about obesity, body

    size, shape and weight: A systematic review. *Journal of Advanced Nursing, 67*(5), 954-

    960. https://doi.org/10.1186/1471-2458-11-188

Reilly, J. (2005). Descriptive epidemiology and health consequences of childhood obesity.

    Best Practice & Research Clinical Endocrinology & Metabolism, 19(3), 327-341.

    https://doi.org/10.1016/j.beem.2005.04.002

Roberto, C. A., Sysko, R., Bush, J., Pearl, R., Puhl, R. M., Schvey, N. A., et al. (2012).

    Clinical correlates of the weight bias internalization scale in a sample of obese

    adolescents seeking bariatric surgery. *Obesity*, *20*(3), 533-539.

    https://doi.org/10.1038/oby.2011.123

Schwimmer, J. B., Burwinkle, T. M., & Varni, J. W. (2003). Health-related quality of life of

    severely obese children and adolescents. *JAMA, 289*(14), 1813-1819.

Scimeca, G., Alborghetti, A., Bruno, A., Troili, G. M., Pandolfo, G., Muscatello, M. R. A., et

    al. (2016). Self-worth and psychological adjustment of obese children: An analysis

    through the Draw-A-Person. *World Journal of Psychiatry*, *6*(3), 329.

    https://doi.org/10.5498/wjp.v6.i3.329

Shoup, J. A., Gattshall, M., Dandamudi, P., & Estabrooks, P. (2008). Physical activity,
quality of life, and weight status in overweight children. *Quality of Life Research, 17*(3),
407-412.

So, H. K., Nelson, E. A., Li, A. M., Wong, E. M., Lau, J. T., Guldan, G. S.,et al. (2008).
Secular changes in height, weight and body mass index in Hong Kong Children. *BMC
Public Health*, *8*(1), 320. https://doi.org/10.1186/1471-2458-8-320

Stevanovic, D. (2013). Impact of emotional and behavioral symptoms on quality of life in
children and adolescents. *Quality of Life Research,22*(2), 333-337.
https://doi.org/10.1007/s11136-012-0158-y

Strong, C., Lin, Y.-C., Tsai, M.-C., & Lin, C.-Y. (2017). Factor structure of Sizing Me Up, a
self-reported weight-related quality of life instrument, in community children across
weight status. *Childhood Obesity, 13*(2), 111-119.
https://doi.org/10.1089/chi.2016.0259

Su, C.-T., Wang, J.-D., & Lin, C.-Y. (2013). Child-rated versus parent-rated quality of life of
community-based obese children across gender and grade. *Health and Quality of Life
Outcomes*, *11*(1), 206. https://doi.org/10.1186/1477-7525-11-206

Tam, C. K., Ng, C. F., Yu, C. M., & Young, B. W. (2007). Disordered eating attitudes and
behaviours among adolescents in Hong Kong: prevalence and correlates. *Journal of
Pediatrics and Child Health, 43*(12), 811-817.

The Government of the Hong Kong Special Administrative Region Press Releases. (October
11, 2016). *Hong Kong World Obesity Day 2016 focuses on childhood obesity.*
http://www.info.gov.hk/gia/general/201610/11/P2016101100232.htm. Accessed 1
December 2017.

Tomiyama, A. J. (2014). Weight stigma is stressful. A review of evidence for the cyclic
obesity/weight-based stigma model. *Appetite, 82*, 8-15.
https://doi.org/10.1016/j.appet.2014.06.108

Vogt Yuan, A. S. (2010). Body perceptions, weight control behavior, and changes in

adolescents' psychological well-being over time: a longitudinal examination of gender.

Journal of Youth and Adolescence, 39(8), 927-939. https://doi.org/10.1007/s10964-009-

9428-6

Wallander, J. L., Taylor, W. C., Grunbaum, J. A., Franklin, F. A., Harrison, G. G., Kelder, S.

H., et al. (2009). Weight status, quality of life, and self-concept in African American,

Hispanic, and White fifth-grade children. *Obesity, 17*(7), 1363-1368.

https://doi.org/10.1038/oby.2008.668

Williams, J., Wake, M., Hesketh, K., Maher, E., & Waters, E. (2005). Health-related quality

of life of overweight and obese children. *JAMA, 293*(1), 70-76.

World Health Organization. (1993). Study protocol for the World Health Organization

project to develop a Quality of Life assessment instrument (WHOQOL). *Quality of Life

Research, 2*(2), 153-159.

World Health Organization. (2007). *Child growth standards*.

http://www.who.int/childgrowth/standards/bmi_for_age/en/. Accessed 1 December

2017.

Wong, Y., & Huang, Y. C. (1999). Obesity concerns, weight satisfaction and characteristics

of female dieters: A study on female Taiwanese college students. *Journal of the

American College of Nutrition, 18*(2), 194-200.

Xin guang ti pan. (n.d.). In *ChineseWords.org.* http://www.chinesewords.org/idiom/show-

11633.html. Accessed 1 December 2017.

Zeller, M. H., & Modi, A. C. (2009). Development and initial validation of an obesity-

specific quality-of-life measure for children: sizing me up. *Obesity*, *17*(6), 1171-1177.

https://doi.org/10.1038/oby.2009.47

Zhang, J., Seo, D. C., Kolbe, L., Lee, A., Middlestadt, S., Zhao, W., et al. (2011).

Comparison of overweight, weight perception, and weight-related practices among high

school students in three large Chinese cities and two large US cities. *Journal of Adolescent Health*, *48*(4), 366-372. https://doi.org/10.1016/j.jadohealth.2010.07.015

Zuba, A., & Warschburger, P. (2017). The role of weight teasing and weight bias internalization in psychological functioning: a prospective study among school-aged children. *European Child & Adolescent Psychiatry*, 1-11. https://doi.org/10.1007/s00787-017-0982-2

Table 1 Body mass index (BMI) cutoffs for classifying children in overweight or non-overweight goup (*cf.* So et. al 2008)

Age in year	BMI (kg/m^2)	
	Boys	**Girls**
8	18.4	17.6
9	19.1	18.0
10	19.7	18.7
11	20.3	19.5
12	20.8	20.4

Note. A child with a BMI value higher than the age- and gender-specific cutoff is classified as overweight; lower than the cutoff is classified as non-overweight.

Table 2 Demographics of the participants

Characteristics	Overweight group (*n*=50)	Non-overweight group (*n*=50)
Age (years), *M* (SD)	9.36 (1.17)	9.73 (1.28)
Gender		
Male	30 (60.0%)	31 (62.0%)
Female	20 (40.0%)	19 (38.0%)
Body mass index, *M* (SD)	22.86 (2.32)	16.27 (2.10)
Health status		
Without chronic illness	48 (96.0%)	47 (94.0%)
With chronic illness	2 (4.0%)	3 (6.0%)
Mother's age, *M* (SD)	41.47 (5.84)	40.35 (5.36)
Father's age, *M* (SD)	45.49 (6.66)	43.90 (8.24)
Monthly family income		
<$25,000 HKD	24 (48.0%)	29 (58.0%)
>$25,000 HKD	25 (50%)	20 (40.0%)
Missing	1 (2.0%)	1 (2.0%)
Rater		
Mother	32 (64.0%)	38 (76.0%)
Father	13 (26.0%)	8 (16.0%)
Others (grandparents or aunties)	5 (10.0%)	4 (8.0%)

Note. Median monthly household income in Hong Kong is around $26,000, referring to the Census and Statistic Department (2017).

Table 3 Differences in weight-related self-stigma and Health- related Quality of life (HRQoL) between overweight (OW) and non-OW groups

	M (*SD*)		*t* or *Z* (*p*-value)
	OW group	Non-OW group	
Self-stigma			
WBIS	26.60 (9.56)	21.52 (7.19)	3.00 (0.003)
WSSQ	14.50 (4.89)	11.02 (4.37)	3.75 (< 0.001)
HRQoL			
Child-rated Kid-KINDL			
Total score	62.72 (12.81)	67.36 (11.07)	1.94 (0.055)
Physical	72.96 (17.76)	76.25 (16.51)	0.96 (0.339)
Emotional	77.13 (17.39)	79.63 (15.51)	0.76 (0.450)
Self-esteem	43.75 (24.32)	51.63 (18.81)	1.81 (0.073)
Family	62.21 (19.34)	69.25 (18.25)	1.87 (0.064)
Friend	67.63 (19.01)	73.42 (17.43)	1.59 (0.116)
School	52.63 (13.25)	54.00 (14.10)	0.50 (0.616)
Parent-rated Kid-KINDL			
Total score	64.13 (10.24)	67.15 (10.40)	1.46 (0.147)
Physical	71.50 (15.98)	73.63 (16.57)	0.65 (0.516)
Emotional	72.63 (13.88)	75.63 (13.02)	1.12 (0.268)
Self-esteem	52.13 (18.02)	55.75 (19.64)	0.96 (0.339)
Family	67.50 (14.51)	70.88 (16.88)	1.07 (0.286)
Friend	66.88 (15.53)	73.38 (14.22)	2.18 (0.031)
School	54.13 (11.61)	53.63 (13.07)	0.20 (0.840)
Sizing Me Up			
Total score	70.39 (13.55)	79.88 (10.27)	3.95 (<0.001)
Emotional	82.83 (19.59)	91.00 (15.69)	2.30 (0.024)
Physical	82.93 (23.61)	93.47 (11.70)	2.83 (0.006)
Teasing/marginalization	82.33 (21.40)	88.00 (20.49)	1.35 (0.179)
Positive attributes	33.00 (20.95)	47.00 (24.47)	3.07 (0.003)
Social avoidance[a]	88.13 (16.40)	93.60 (12.04)	1.96 (0.050)
Sizing Them Up			
Total score	77.70 (11.97)	85.86 (5.90)	4.33 (<.001)
Emotional	82.21 (14.60)	92.76 (8.06)	4.47 (<.001)
Physical	88.53 (12.78)	96.40 (5.59)	3.99 (<0.001)
Teasing/marginalization	84.00 (16.97)	96.44 (6.90)	4.80 (<0.001)
Positive attributes	45.00 (19.78)	51.17 (22.02)	1.47 (0.144)
Mealtime	82.33 (18.57)	82.00 (19.87)	0.09 (0.931)
School	94.67 (18.27)	100.00 (0.00)	2.28 (0.022)

WBIS, Weight Bias Internalization Scale; WSSQ, Weight Self-Stigma Questionnaire; HRQoL, Health-related Quality of life.

[a] Mann-Whitney U test was used because of the non-normal distribution.

Table 4 Correlation between weight-related self-stigma and health-related quality of life (HRQoL) for overweight group

HRQoL measures	r (p-value)	
	WBIS	**WSSQ**
Child-rated Kid-KINDL		
Total score	-0.44(0.001)	-0.28 (0.052)
Physical	-0.54 (<0.001)	-0.43 (0.002)
Emotional	-0.44 (0.001)	-0.24 (0.101)
Self esteem	-0.05 (0.751)	-0.11 (0.436)
Family	-0.45 (0.001)	-0.16 (0.266)
Friend	-0.24 (0.090)	-0.08 (0.599)
School	-0.15 (0.303)	-0.17 (0.248)
Parent-rated Kid-KINDL		
Total score	-0.41 (0.003)	-0.38 (0.006)
Physical	-0.47 (0.001)	-0.54 (<0.001)
Emotional	-0.26 (0.065)	-0.14 (0.345)
Self esteem	-0.17 (0.230)	-0.31 (0.027)
Family	-0.36 (0.009)	-0.15 (0.307)
Friend	-0.24 (0.099)	-0.26 (0.087)
School	-0.16 (0.279)	-0.12 (0.406)
Sizing Me Up		
Total score	-0.56 (<0.001)	-0.36 (0.010)
Emotional	-0.61 (<0.001)	-0.32 (0.022)
Physical	-0.39 (0.005)	-0.37 (0.008)
Teasing/marginalization	-0.35 (0.012)	-0.16 (0.255)
Positive attributes	-0.08 (0.578)	0.05 (0.740)
Social avoidance	-0.59 (<0.001)	-0.46 (0.001)
Sizing Them Up		
Total score	-0.34 (0.016)	-0.33 (0.019)
Emotional	-0.28 (0.050)	-0.20 (0.165)
Physical	-0.28 (0.050)	-0.28 (0.046)
Teasing/marginalization	-0.20 (0.174)	-0.21 (0.153)
Positive attributes	-0.24 (0.089)	-0.33 (0.018)
Mealtime	-0.30 (0.032)	-0.26 (0.068)
School[a]	-0.18 (0.212)	-0.19 (0.188)

[a] Spearman's rho tests were used because of the non-normal distribution.

Table 5 Correlation between weight-related self-stigma and health-related quality of life (HRQoL) for non-overweight group

HRQoL measures	*r* (*p*-value)	
	WBIS	**WSSQ**
Child-rated Kid-KINDL		
Total score	-0.31 (0.030)	-0.13 (0.366)
Physical	-0.26 (0.067)	-0.09 (0.548)
Emotional	-0.09 (0.516)	-0.01 (0.972)
Self esteem	-0.09 (0.537)	-0.03 (0.820)
Family	-0.36 (0.011)	-0.14 (0.352)
Friend	-0.19 (0.180)	-0.11 (0.449)
School	-0.22 (0.130)	-0.16 (0.284)
Parent-rated Kid-KINDL		
Total score	0.07 (0.624)	-0.01 (0.971)
Physical	-0.13 (0.353)	-0.10 (0.505)
Emotional	0.07 (0.642)	-0.19 (0.189)
Self esteem	0.19 (0.176)	0.14 (0.333)
Family	0.02 (0.918)	-0.02 (0.874)
Friend	-0.01 (0.923)	-0.03 (0.857)
School	0.15 (0.310)	0.13 (0.358)
Sizing Me Up		
Total score	-0.42 (0.002)	-0.11 (0.441)
Emotional	-0.44 (0.001)	-0.07 (0.620)
Physical	-0.45 (0.001)	-0.23 (0.114)
Teasing/marginalization	-0.31 (0.030)	-0.02 (0.890)
Positive attributes	-0.09 (0.551)	0.01 (0.950)
Social avoidance[a]	-0.31(0.027)	-0.22 (0.127)
Sizing Them Up		
Total score	-0.14 (0.328)	-0.14 (0.352)
Emotional	-0.06 (0.699)	-0.05 (0.711)
Physical	-0.35 (0.012)	-0.32 (0.026)
Teasing/marginalization	-0.18 (0.207)	-0.04 (0.768)
Positive attributes	0.08 (0.607)	0.02 (0.875)
Mealtime	-0.21 (0.145)	-0.17 (0.232)
School[a]	-[b]	-[b]

[a] Spearman's rho tests were used because of the non-normal distribution.
[b] Correlations cannot be performed because the School domain scores were 100 for all participants.

Table 6 Prediction ability of weight-related self-stigma on health-related quality of life (HRQoL) for overweight children[a]

HRQoL measures	β (p-value)	
	WBIS	**WSSQ**
Child-rated Kid-KINDL		
Total score	-0.36(0.019)	--[b]
Physical	-0.35 (0.025)	-0.35 (0.029)
Emotional	-0.38 (0.015)	--[b]
Family	-0.44 (0.004)	-- [b]
Sizing Me Up		
Total score	-0.59 (<0.001)	-0.52 (0.001)
Emotional	-0.69 (<0.001)	-0.52 (<0.001)
Physical	-0.40 (0.004)	-0.45 (0.001)
Teasing/marginalization	-0.35 (0.026)	-- [b]
Social avoidance	-0.60 (<0.001)	-0.61 (<0.001)

[a] Age, gender, and with (or without) chronic illness were controlled in all the regression models.

[b] Regression models were not constructed because of non-significant correlation between self-stigma and the HRQoL domain.

β= standardized coefficient.