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"Thin people…. they're healthy." Young children's understanding of body weight change

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What is already known about this subject:

- Weight, especially overweight, is increasingly relevant to the lives of very young children.
- Evidence that by the age of 5-years old, children show negative stereotyping of fat body shapes, and knowledge about dieting and basic concepts related to nutrition.
- That health literacy in children (and their parents) is fundamental to engagement with and outcomes from health initiatives.

What this study adds:

- The breadth of understanding shown by very young children regarding the motivations for and consequences of weight change.
- A demonstration of the utility of qualitative research with very young children.
- Information of value to those developing weight-related health literacy in Primary school-aged children.

ABSTRACT

Background: While research has investigated negative stereotyping of fat body shapes, little has focused on very young children's understanding of the mechanisms, motivations, and consequences of weight change.

Objectives: To investigate children's understanding of how weight change is achieved, people's motivation for weight change, and the consequences of weight loss or weight gain.

Methods: One hundred children (mean age 5.2, 38 girls) read a book in which one of the main characters (male/female according to the child's sex) was either healthy weight or overweight. Afterwards, this character was described as gaining or losing weight, and drawings which depicted the child in the story as either healthy weight or overweight were presented to the child and discussed. An audio-recorded semi-structured interview followed and transcripts were analyzed using thematic analysis.

Results: Nearly all children described the weight/shape change and attributed this to food more frequently than exercise. Weight loss was viewed positively and both motivations and consequences grouped under two master themes (physical and social reasons). No clear gender differences were observed in these responses.

Conclusions: Talking with 5-year olds showed them to be observant and knowledgeable, especially about motivations for and consequences of weight change. For those working to improve children's health literacy this suggests receptiveness to early and fact-based education.

INTRODUCTION

Efforts to address obesity are increasingly focused on young children, at home and at school. Reviews of interventions with children at pre-school and early school age are broadly positive, indicating some impact on behaviours relevant to obesity (1). Concurrently, surveillance programmes have been initiated to monitor trends in prevalence and assess the impact of local initiatives. The National Child Measurement Programme (NCMP) in the UK, for example, measures the height and weight of all state Primary School children at two points (in Reception class, 4-5 year olds, and Year 6, 10-11 year olds) (2). Parents are then sent written information about their child's body weight. Benefits and negatives of the process have been voiced and investigated (3). While likely to be experienced most keenly by those most overweight, the consequences of surveillance are relevant to all children given the inclusiveness of the process. Set against a background of promoting healthy eating and activity in early care and educational settings, there are important questions regarding what very young children understand about obesity and weight change.

Three broad areas of investigation illustrate how informed children are by the age of 5. First, the negative stereotyping of fat body shapes or characters is apparent (4), with friendship preferences especially influenced (5,6). In these experiments some very young children reflect back the weight bias that is prominent in society. Second, between a third and two thirds of US 5-year olds comprehend dieting as a mechanism for weight loss, especially those whose mothers are currently or recently dieting (7). When pressed regarding the meaning of dieting however, relatively few relate this to food intake or weight loss (8). Third, 5-year old children have a basic grasp of several aspects of nutrition and the purpose of eating (9). Many can

distinguish between photographs of healthy and less healthy foods (10), and they can describe some of the benefits to healthy eating (11).

A few studies of this age group have also included prompts regarding children's understanding of causes of overweight and/or weight gain. For example, when asked, "What can make people weigh too much?", half of the 5-year old girls in Abramovitz and Birch's (7) study referred to eating behaviours (e.g. eating lots of food). In addition, Fielden et al (12) used toy foods and pictures as prompts with a small group of 4-5-year olds. These children linked eating too much to becoming fat and saw hospital treatment as the solution, but showed confusion between describing foods as "good" (i.e. those they like to eat) and "healthy". What is currently lacking in this literature is a specific focus on children's understanding of how weight change is achieved (fat to thin, and vice versa), and the reasons for and benefits of weight change.

Health literacy in children (and their parents) is fundamental to engagement with, and outcomes from, health initiatives (13). It is argued that health literacy skills should be encouraged from a very young age given that children see and react to health messages and are increasingly involved in their own healthcare management (14). Children's gender may also be relevant as reviews of research with older children show that girls express more body dissatisfaction and more negativity to heavier female body figures than boys (15). Accordingly, the present study aimed to investigate very young children's understanding of how weight change is achieved, people's motivations for weight change, and the consequences of weight loss or weight gain. Potential gender differences in understanding were also examined.

METHODS

Participants

One hundred children (38 girls, 62 boys, mean age 5.2, range 4.0 to 6.9) from 2 Primary Schools in the North of England took part in the study. All participants were either in Reception or Year 1 of the national curriculum in England and were those for whom parental consent was received and who attended school on the study day. They represented 48% of the school register for these classes. No information is available on the non-participants. The schools' catchment areas varied but were mostly low to middle class and around two thirds of the children had a white British ethnic background. Ethical approval for the study was from the joint Leeds Institute of Health Sciences, Leeds Institute of Genetics, Health and Therapeutics, and Leeds Institute of Molecular Medicine ethics committee.

Materials

Story books. Four versions of a single story book developed by Harrison et al (6) were used. They were identical except that one of the main characters ('Alfie') appeared as healthy weight in one version of the book and as overweight in a second. In the other books 'Alfina' (a female character) replaced 'Alfie', again as healthy weight and overweight. Boys read the books with 'Alfie' and girls the books with 'Alfina'. Allocation to the healthy weight or fat 'Alfie/Alfina' story book was done on an alternating basis. The story was a simple narrative describing a cat that runs up into a tree chasing birds. The books were designed to be colourful, clear and simple, with the aim of being enjoyable for the child taking part. The presentation style was consistent with a popular reading scheme used in English schools by this age group of children.

Character pictures. After reading the story children were shown two pictures of 'Alfie/Alfina' on a single A4 laminated sheet (Figure 1). The figure of the left matched 'Alfie/Alfina' as represented in the story, the figure on the right was the opposite body shape. Children were told, "This is Alfie/Alfina from the story when he/she is X-years old (adjusted to match the age of the participant) and this is still Alfie/Alfina but he/she is a little bit older" (the picture on the right).

- Figure 1 near here -

Perceived body shape. Children were asked to indicate their perceived body shape using the gender-specific body figure scales of Collins (16). Each child was asked, "Which child do you most look like?" from the 7 drawings of a child's body size ranging from very thin to obese and following the procedure described by Holub (2008).

Procedure

The researcher met with each child individually in a quiet part of the library area or classroom, away from other children. The child's verbal assent was obtained and the audio recorder switched on. Children were assured that there were no right or wrong answers and that the researcher was interested in everything they had to say. After reading the story book, children were presented with the two pictures of 'Alfie/Alfina' as described above. The following questions were asked in a semi-structured interview format:

- Do you think 'Alfie/Alfina' has changed?
- What's changed about him/her?
- What might have made him/her (child's own word for change)?

- Do you think 'Alfie/Alfina' wanted to become (child's own word for change)?
- Why do you think he/she wanted to become (child's own word for change)?
- How do you think she feels now he/she's (child's own word for change used)?
- Are there any good things about becoming (child's own word for change)?
- Are there any bad things about becoming (child's own word for change)?

Supplementary questions were used when prompting was necessary.

Finally, children were asked to indicate their perceived body shape using the Collins scale. Audio recording was then stopped and children were given a sticker to thank them for their participation.

Data analysis

The voice recordings were transcribed verbatim. Transcripts were analyzed using thematic analysis (17). Initial themes were generated from the responses for each research question. These themes were reviewed and refined until final master and super-ordinate themes were decided upon. Thematic maps were created and example responses were extracted for each theme.

The frequency data generated from the children's responses were organized and tabulated, according to the primary and secondary questions asked during the interview. Chi-squared tests examined differences in proportions of statements regarding weight loss and gain, and between girls' and boys' responses. The likelihood of difference was expressed as a risk ratio with 95% confidence intervals.

RESULTS

Children's perception of how body weight is changed

In response to the question of whether 'Alfie/Alfina' had changed and what had changed about them, over half (56%) of the children referred specifically to 'fat' and 'thin' (e.g. "He's got fat!"), 26% reported it in relation to size (e.g. "Alfina's a bit bigger"), and 7% to shape (e.g. "He's got round"). Only 6% of children failed to identify the change in response to this first question.

In relation to what might have made 'Alfie/Alfina' change, food was referred to by 96% (49/51) of children in relation to weight gain and 55% (27/49) in relation to weight loss. Accordingly, children were 1.74 (95% CI: 1.34, 2.26) times more likely to mention food in relation to weight gain than to weight loss. Exercise (mainly lack of it) was referred to by 37% (19/51) of children in relation to weight gain whereas 65% (32/49) did so in relation to weight loss. Children were 1.75 (1.16, 2.64) times more likely to mention exercise in relation to weight loss than to weight gain.

Further examination showed that 80% (39/49) of the children who mentioned food in relation to weight gain did so without being prompted during the interview, whereas only 11% (2/19) mentioned exercise without a prompt (a significant difference in proportions, $\chi^2(1)=27.28$, $p<.001$). Similarly, children who mentioned food in relation to weight loss were 2.70 (1.31, 5.60) times more likely to do so without a prompt than mention exercise without a prompt (59% vs. 22%). There were no sex differences in these references, unprompted or prompted.

Children who thought food was involved in 'Alfie/Alfina's' weight change were asked 'What kind of food might 'A' have eaten'? Children spoke more about the amount of

227 food eaten than the type of food eaten. Some 69% (34/49) of children thought that
228 'Alfie/Alfina' had increased his/her food intake to increase weight (e.g. "She's eaten
229 lots of food") and 44% (12/27) thought reducing food intake caused the decrease in
230 weight. Of those in the weight gain group, 37% (18/49) spoke about 'Alfie/Alfina'
231 eating high energy food (e.g. *"Her eated lots of sweeties....and a big fat cookie"*). In
232 addition, girls were more likely than boys to mention high calorie food (36% vs. 16%,
233 $\chi^2(1)=4.02$, $p < .02$). There were several others who mixed high and low energy
234 foods e.g. *"He eats lots of food...(like) apples, orange, chocolate and ice-cream"*
235 (Boy, Weight Gain Group); "*Eaten too much...fatty stuff...(like) broccoli, carrots,*
236 *potato, erm chicken"* (Boy, Weight Gain Group).
237
238 When asked about the type of exercise that was involved in 'Alfie/Alfina's' weight
239 change, children were 2.08 (1.02, 4.22) times more likely to give examples in the
240 weight loss group than in the weight gain group (66% (15/23) vs 32% (6/19)). In
241 addition, boys were 1.95 (1.05, 3.61) times more likely than girls to mention a type of
242 exercise (68% vs. 35%) regardless of the direction of weight change (e.g. *"Exercise*
243 *makes you more thin...(like) playing football"*; Boy, Weight Loss Group). Many of the
244 children in the weight gain group gave reasons that referred to the absence or
245 reduction of exercise (e.g. *"Exercise will make her thin so no...I think she's been*
246 *lazing around and being lazy"*). Similarly, children in the weight loss group referred
247 to how an increase in exercise would decrease 'Alfie/Alfina's' weight (e.g. *"He might*
248 *of done star jumps and a little bit more sporty...cos they make you fit...fit and*
249 *healthy"*). There was no sex difference in these responses.
250
251 <u>Motivations for body weight change</u>

Table 1 shows that 82% (40/49) of children in the weight loss group thought that 'Alfie/Alfina' wanted to change weight (from fat to thin), compared with 35% (18/51) of children in the weight gain group. Accordingly, children in the weight loss group were 2.31 (1.56, 3.43) times more likely to think that 'Alfie/Alfina' wanted to lose weight (when fat) than gain weight (when healthy weight), views that did not differ between girls and boys.

Over half the sample (55%) gave answers to the question, 'Why do you think 'Alfie/Alfina' did/did not want to change weight?' Again, there were no clear sex differences (in frequency or content) and children's responses are summarized in a single thematic map (Figure 2). Two master themes (physical and social reasons) and four super-ordinate themes grouped children's reasons for 'Alfie/Alfina' wanting to lose weight. Improving physical competence and reducing illness accounted for half of these responses. The avoidance of negative comments from others was another common theme for weight loss, and bridging the physical and social master themes was improvement in appearance. These super-ordinate themes were mirrored in the reasoning of children for whom 'Alfie/Alfina' gained weight. The negative aspects of appearance were commented on, as were the negative reactions of others. There were perceived physical downsides as well, especially in relation to activity and games participation.

- Table 1 and Figure 2 near here -

The smaller number of children who said 'Alfie/Alfina' would want to gain weight also gave physical competence ("*He can smash up the baddies"; "She wants to do things that are more grown up"*) and appearance reasons (*"She's too skinny and she*

doesn't like to be"). Two children (girls) saw the benefit in food consumption (*"She gets to eat lots of food"*).

The consequences of body weight change

Children's responses to, 'How do you think 'Alfie/Alfina' feels now he/she has changed?' were coded by affective valence. The majority (84%, 41/49) of children in the weight loss group thought that 'Alfie/Alfina' would be experiencing positive feelings. They were 3.05 (1.92, 4.83) times more likely to mention positive emotions in relation to weight loss than those in the weight gain group. Complementing this, children were 8.65 (2.80, 26.67) times more likely to think 'Alfie/Alfina' was experiencing negative emotions due to weight gain than to weight loss (53% (27/51) vs 6% (3/49)). Furthermore, regardless of the direction of change, girls were more likely to infer negative feelings (41% vs. 23%, $\chi^2(1)=3.70$, $p<.05$) and boys positive feelings (62% vs 44%, $\chi^2(1)=3.36$, $p<.05$) in response to 'Alfie/Alfina's' body weight change.

When asked about the good or bad things about changing weight, children in the weight gain group were more likely to provide a detailed answer than children in the weight loss group (78% vs 63%). However, there was no sex difference in the number of responses. The thematic map (Figure 3) shows that physical ability was frequently commented on by children. Improvements in physical ability were the most frequently cited positive consequence of weight loss and limitations associated with weight gain. Poor health or physical state was the main perceived negative consequence of weight gain. Far fewer children commented on health improvement as a consequence of weight loss. The negative reactions of others were equally

referred to, in terms of their removal or increase. Issues related to appearance were raised only when 'Alfie/Alfina' gained weight.

- Figure 3 near here –

Of the few responses that were coded as negative about weight loss and positive about weight gain, they fell into 3 broad groupings. One related to the change in age introduced as the rationale for change in body weight; five children referred to the advantages of being older (e.g. *"You get to learn things, big things"*). A further five saw some benefit to physical activity (e.g. *"If you're big you can reach up to a tree and you can climb up a tree"*). Poor health was a negative reason for losing weight for just 2 children (*"If you get too thin you could die"*).

Finally, girls and boys indicated their perceived body shape at a modal value of 4 on the Collins scale with the full range of shapes being selected. A sample of 20 interviews was examined, choosing children from across the range of body shape choices. There was no discernable pattern that associated children's body shape choices with their verbal responses.

DISCUSSION

An increased emphasis on food, eating and (over-) weight has been a consequence of the activities that have included very young children in health promotion, weight surveillance and obesity prevention. And yet we are uncertain regarding what knowledge children have about weight change when they start school. Talking to very young children about weight change showed them to be observant and knowledgeable. Nearly all children reported on the change in the story character's appearance in terms of weight or shape. They all talked about either food or activity

in relation to weight loss and weight gain, although food was more likely to be mentioned and often without prompting. The frequent and spontaneous references to food and/or activity as reasons for weight change are consistent with the simple input-output rules relating eating to body weight previously observed in children aged 5 (9, 11). The main contribution of this study however, is in revealing these children's understanding of the motivations for, and consequences of, weight change. The majority of children gave reasons that encompassed health, physical ability, concern for appearance, and the (often negative) behaviours of others. While children's conversations were fairly brief, the perceived benefits of weight loss were clear in their responses, as were the drawbacks of obvious weight gain.

Children's ability to identify the change in body weight or shape, relate this to eating and activity, and appear relatively sophisticated in their reasoning, reflects normal cognitive development. Earlier research on children's thinking about food and eating adhered closely to Piagetian stages, noting the distinction between pre-operational and operational thought at age 6-7 (19, 20). However, various cognitive and linguistic achievements are now recognised prior to this age and are relevant to the present study. For example, children's physical body awareness emerges from around 20 months. By the age of two and a half, most children can locate and label common body parts (e.g. nose, hand, foot) and show a basic awareness of their own body size relative to the physical environment (21). This body knowledge increases rapidly thereafter and is strongly related to the frequency with which caregivers name parts of the body in social interactions and play (22). The distinctions between fat and thin, or big and little, are body shape comparatives that are frequently heard, acquired early and talked about by children. They mirror other comparatives (e.g. good/bad, hard/soft, tall/short) that children understand and use by age 3. By the

age of 4, normally developing children have also acquired a knowledge of intentional states i.e. what another person might be thinking or might want and that others have feelings and motivations that may be different to their own (23). This acquisition of a theory of mind influences social interactions and their interpretation, in everyday life as well as in stories.

That children volunteered health, physical function, appearance, and the avoidance of social censure as under-pinning weight change, reflects the public discourse on body weight. The social impact of body size or weight is apparent in evidence from studies of older Junior school aged children (15). This review of research published between 1997 and 2010 noted more evidence of social negativity to overweight (people being judged by their weight and discriminated against) than children's awareness that overweight impacted on health. In relation to the consequences of weight change, children in the present study were more likely to describe health, physical state or ability, than social reasons. This difference in outcome may be due to a variety of features. For example, we asked directly about consequences whilst most previous research has directed attention to children's awareness of body weight and shape stereotypes. Within the story that preceded discussion the children were playing with a ball in the park. In addition, our research was conducted at school where activity and health have prominence in the curricular and everyday activities of these children. Alternatively, the difference may reflect the increased access to information on weight and eating that this sample of children has compared with those a decade and more ago.

Interestingly, we detected no influence of children's own body size on their expressed views. There are concerns regarding the reliability of body shape choices

made at this age given the absence of psychometrically tested instruments (24). In addition, we chose to use body shape selections rather than to recruit and compare measured obese and healthy weight children. Past experience is that a requirement to weigh children (outside of the NCMP assessment) drastically reduces parental consent. Neither were there major gender differences in children's responses. Girls inferred more negative emotions and boys more positive feelings as consequences of weight change, regardless of direction. However, there were no differences in the number or proportions of physical or social reasons for motivations or consequences of weight change.

In terms of strengths, the present study had a large sample size and used a qualitative research approach. The latter is a reminder of the viability of qualitative research with young children (25) and the value of listening to what they have to say. Like others (e.g. 12), we used good quality visual aids (story books and pictures) in a familiar environment to help generate discussion. Regarding weaknesses, the study recruited fewer girls than boys, and drew from a single geographical area. Without information on ethnicity or social class variation this limits generalizability of the study findings. We also noted confusion in a few children regarding how 'Alfie/Afina' differed i.e. a few children interpreted a difference in age rather than body weight/shape.

Future research could relate children's knowledge and attitudes to their social environment. These are likely to be influenced by having older siblings and by parental obesity and/or dieting behaviour (7). Very young children's illness causality understanding is strongly influenced by illness experiences and messages within the

family (26). Similar family socialization processes would be expected in families for whom obesity or weight change are prominent.

In conclusion, this research is testimony to the knowledge, broad in compass but limited in depth, which many 5-year olds have regarding body weight and weight change. It varies widely between individuals but reflects what is common in public discourse. Given space (offered in this qualitative approach), many children voiced issues other than the stereotyped character values of body shape and appearance. That children of this age will reflect on physical function and health indicates that they may be receptive to early and fact-based education on weight and weight change. If children's health literacy is a valued and agreed objective (27) then this should be assurance for those who design such programmes. Improvements in weight-related health literacy could also help counter stereotyping and anti-fat attitudes.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Table 1: Children's agreement regarding whether 'Alfie/Alfina' wanted to lose or gain weight (%, N).

	Weight loss		Weight gain	
	Alfie (N=32)	Alfina (N=17)	Alfie (N=29)	Alfina (N=22)
'Alfie/Alfina' wanted to change weight	84 (27)	76 (13)	31 (9)	41 (9)
Proportion providing a detailed answer	63 (20)	29 (5)	52 (15)	68 (15)

503 Figure 1: The drawings of ‘Alfie’ and ‘Alfina’ (normal weight and fat) used to indicate
504 body weight change.
505

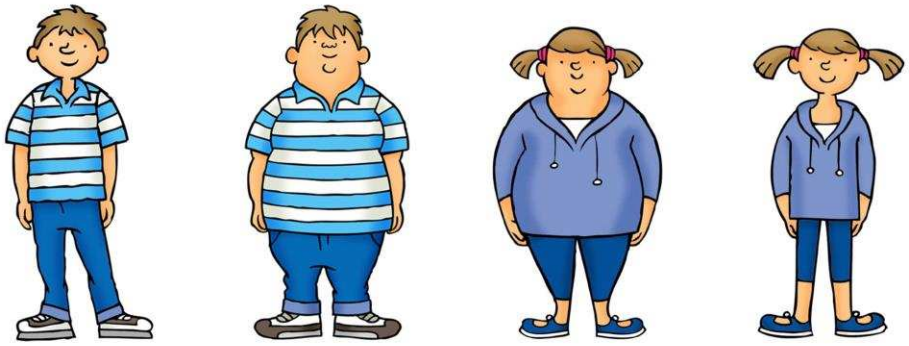

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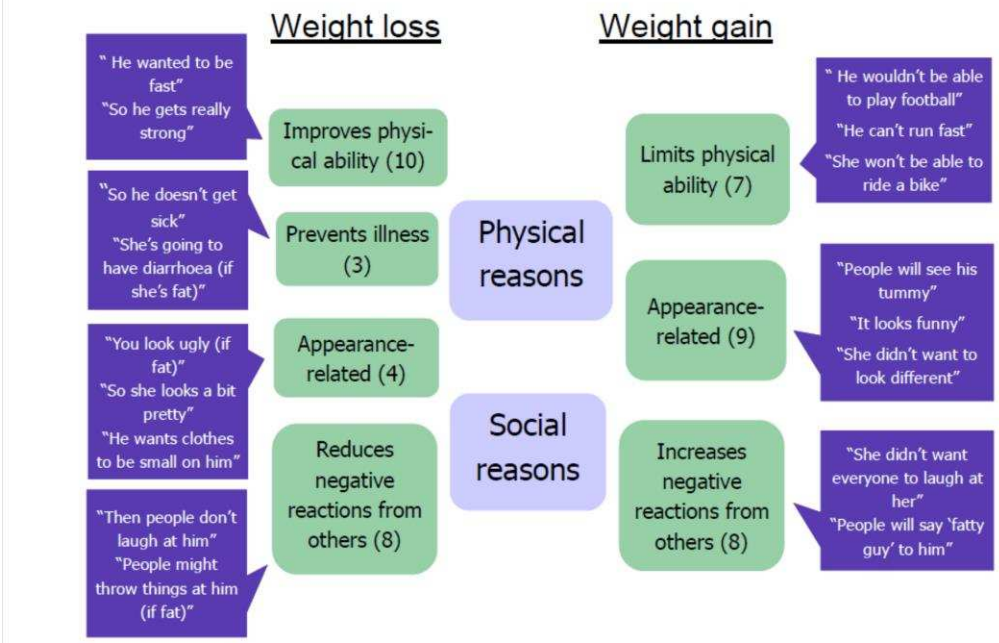
Figure 2: Thematic map of children's perceived motivations for body weight change (open boxes are master themes, shaded boxes are super-ordinate themes).



513 Figure 3: Thematic map of children's perceived consequences of body weight
514 change (shaded boxes are super-ordinate themes).
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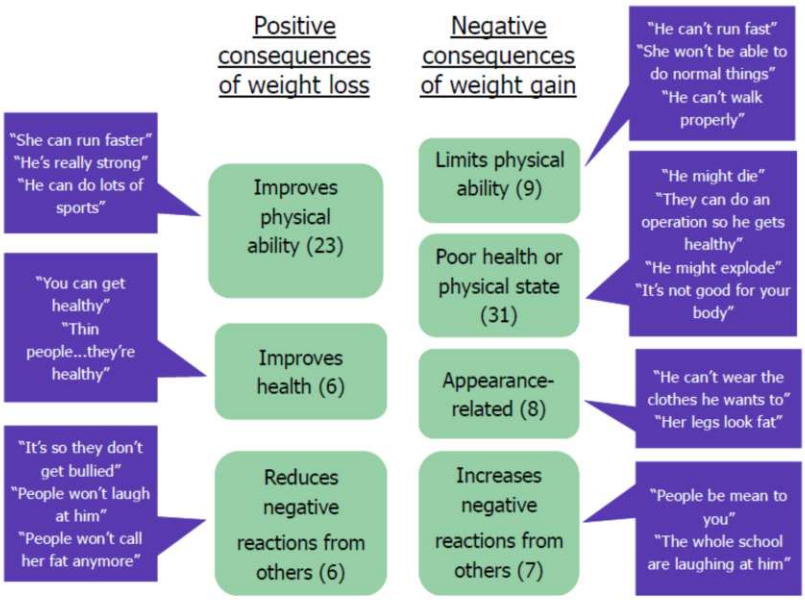

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