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Long-term effects of the RealFit intervention on self-esteem and food craving

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ABSTRACT

Background: RealFit is a 13-week weight-reduction programme for adolescents. This study investigated the programme’s long-term effectiveness regarding the psychological outcomes of self-esteem and food craving. Methods: The study had a quasi-experimental design. Body mass index, self-esteem and food craving were assessed at baseline (T0), immediately after RealFit (T1), and after five months (T2) and one year (T3) of follow-up. Control participants (n = 32) were overweight adolescents who received no treatment. Results: Comparison between the intervention (n = 86) and control groups showed a significant difference for the self-esteem domain of global self-worth (1.63; 95% confidence interval: 0.28 to 2.99) in favour of the intervention group. The differences regarding overall self-esteem and the physical appearance domain showed a trend towards improvement. No significant difference was found for food craving. Conclusions: Taking all results and limitations into account, it may cautiously be concluded that RealFit has beneficial long-term effects on some domains of self-esteem, but no substantial effect on food craving. The appropriate duration and delivery of cue-exposure sessions in groups of overweight adolescents to decrease food craving should be investigated to further improve the RealFit intervention.

KEYWORDS

Overweight/obesity; adolescents; treatment; self-esteem; food craving

Introduction

Overweight and obesity are worldwide health problems, with dramatically increasing prevalence rates even in youths (Lobstein et al., 2015). Globally, 180 million children (<18 years) are overweight (WHO, 2012). In the Netherlands, 13–15% of children (aged two to 21 years) are overweight (2% obese), a two-fold to three-fold increase compared with the 1980 prevalence rates (Schonbeck et al., 2011). Research conducted by the
Public Health Services (GGD) in the Southern Limburg region of the Netherlands has shown that 15–16% of children aged 13–14 years were overweight (3% obese), while in the 15–16 age category 16–19% were overweight (4–5% obese) (Lamberts et al., 2010; Steenbakkers, Vermeer, Janssen-Goffin, & Hajema, 2014). These prevalence rates are alarming, because overweight and obesity can lead to type 2 diabetes, cardiovascular diseases and metabolic syndrome developing even at a young age (Ogden, Carroll, & Flegal, 2003).

**Treatment for overweight adolescents**

Weight-loss interventions for young people typically focus on reducing energy intake and stimulating physical activity, and involving the parents in the treatment. Many of these interventions are ineffective in the long term, with only one-third of participants no longer being overweight in adulthood (Garner & Wooley, 1991; Jeffery et al., 2000). There is thus room for improvement, by reconsidering treatment components for overweight youths. Several reviews have demonstrated that cognitive behavioural therapy, in combination with diet and/or physical activity components, promotes weight loss and that it is crucial for successful maintenance of the healthy behaviour in the long term (Oude Luttikhuis et al., 2009; Shaw, O’rourke, Del Mar, & Kenardy, 2005; Werrij et al., 2009). In response to these findings and the rising overweight prevalence, RealFit was developed in the Netherlands in 2003 by three collaborating regional health organisations (GGD Westelijke Mijnstreek, Huis voor de Sport Limburg and Thuiszorg Westelijke Mijnstreek). RealFit consists of nutritional, physical activity and psychological classes, and parental participation. The psychological classes consist of cognitive therapy, social skills training and cue exposure to target self-esteem and food craving. The added value of the psychological classes in the RealFit intervention was investigated by Mulkens, Fleuren, Nederkoorn, and Meijers (2007). Adding a psychological component resulted in a greater decrease in body mass index (BMI) and an increase in self-esteem in the short term.

**Self-esteem**

Apart from medical consequences, psychosocial problems appear to be the most direct and significant consequences of overweight and obesity among children and adolescents (Strauss, 2000; Tang-Peronard & Heitmann, 2008). Low self-esteem and obesity seem to reinforce one another in a causal loop (Griffiths, Parsons, & Hill, 2010). Griffiths et al. (2010) carried out a meta-analysis to establish the specific domains of self-esteem that were affected in obesity. They found that athletic achievements (AA) and physical appearance (PA) were consistently proven domains of low self-esteem in obese youngsters. Global self-worth (GS) was also found to be low in the majority of the studies included in the meta-analysis. Results in other domains of self-esteem, like scholastic/cognitive competence and social acceptance/competence, were less clear-cut.

**Food craving**

There is a subgroup of people who eat in response to external cues (like the smell and presence of food) instead of internal cues (like hunger and satiety) (Faith, Scanlon, Birch, Francis, & Sherry, 2004). This can in turn lead to disturbed eating patterns like “eating
in the absence of hunger” and eventually to excessive weight gain (Birch, Fisher, & Davison, 2003). Eating in the absence of hunger but in response to external cues can result in a learned reactivity towards these cues, also known as a Pavlovian conditioned response. In a Pavlovian conditioning model, food intake is considered an unconditioned stimulus, and the physiological reactions (such as salivation) are considered unconditioned responses. If certain cues are consistently followed by food intake, these cues can then by themselves elicit bodily responses. That is, they become conditioned stimuli for food intake (the unconditioned stimulus), triggering the conditioned responses which are experienced as craving (Jansen, 1998). Food craving, which can be defined as an intense desire to eat, can thus be considered a conditioned response which is thought to mediate uncontrolled eating behaviour and as such is related to body weight (Nijs, Franken, & Muris, 2007). Targeting the sensitivity to external cues successfully by extinguishing the association between cues and food intake would thus lead to a decrease in cue reactivity, and hence craving, which implies a decrease of eating in the absence of hunger (Boutelle et al., 2011). In practice, craving can be tackled by repeatedly offering the associated cues to a person without the subsequent intake of the food. This technique, called cue exposure with response prevention, involves the individual holding the craved food under their nose, smelling it deeply and repeatedly, thereby experiencing (increased) craving, but without eating it. Doing this for a prolonged time and repeatedly will eventually extinguish the desire to eat the food.

The current study

The current study investigated the long-term effects of RealFit. The anthropometric results of this study are presented in Bartelink, Jansen, Kremers, Mulkens, and Mujakovic (2014). A significant decrease in BMI and waist circumference was shown one year after the programme, whereas the control group significantly increased in both outcome measures. The aim of the present article is to examine the psychological correlates within the RealFit participants and their changes one year after RealFit. We hypothesised that at one-year follow-up, overall self-esteem and the AA, PA, and GS domains would be increased and food craving would be decreased, compared with the control group.

Methods

Study design

The current study had a quasi-experimental design. Ethical approval for the study was obtained from the Ethics Committee of the Faculty of Psychology and Neuroscience of Maastricht University. Measurements took place before the start of the intervention (T0, baseline), immediately after the intervention (T1), and at five months (T2) and one year of follow-up (T3).

RealFit intervention

RealFit is a 13-week non-school-based intervention for adolescents, consisting of four components: exercise classes, nutritional classes, psychology classes and parental
participation (Bartelink et al., 2014). Each RealFit group had a professional team consisting of one dietician (four different dieticians participated in the current study: $n = 4$), one sports instructor ($n = 5$) and one psychologist ($n = 3$). This team filled out a logbook for each lesson to keep each other updated during the intervention. Given the focus of the present study on psychological outcomes, only the psychological part of the intervention is explained here. RealFit includes 10 one-hour group psychological classes, led by qualified psychologists. The aim of these classes is to change dysfunctional ways of thinking into more rational alternatives, to foster more positive feelings (including improvement of the participants’ self-esteem and body esteem), to decrease craving for unhealthy and large amounts of food, and to make participants act in accordance with these thoughts and feelings. The sessions comprise a general part (explanation of rationale, relapse prevention; two hours) and three special components. The first of these is cognitive therapy (4.5 hours), based on cognitive theory (Beck, 1975), to replace negative irrational cognitions about food, eating, body (or body shape) and the self by rational alternatives (Bandura, 1989). The second component consists of social skills training (two hours) to improve the ability to react appropriately in difficult situations; for example, when being bullied or when food is offered (Goldstein, Poole, Safko, & Addison, 2002). The third component involves cue exposure with response prevention (1.5 hours) to decrease food craving, in which conditioned stimuli (cues, such as the presence of high-caloric food) were detached from unconditioned stimuli (food intake and/or binge eating) by smelling the food without eating it, thereby extinguishing the learned responses (cue reactivity, craving) (Conklin & Tiffany, 2002; Jansen, 1998).

Participants

Intervention group

Participants for the intervention group were recruited by paediatricians and dieticians, and through advertisements in newspapers, face-to-face promotion actions and promotion materials distributed in schools, pharmacies, libraries and physiotherapy practices in the southern Limburg region. The inclusion criteria were: aged between 13 and 18 years, and being classified as overweight or obese based on the BMI cut-off points proposed by Cole, Bellizzi, Flegal, and Dietz (2000). All participating adolescents and their parents gave informed consent. A total of 86 participants were included, which resulted in seven RealFit groups (average of 12 participants per group; range eight to 15 participants) starting between February 2011 and February 2012. Sixty-seven participants completed the programme and participated in at least two measurements. Ninety-six per cent of the participants did not miss more than one lesson. The participants who dropped out of the programme or did not participate in at least two measurements ($n = 19$) were not significantly different from the other participants with respect to age, gender, BMI $z$-score, self-esteem or food craving scores at baseline.

Control group

The control group was defined as a comparable group of overweight or obese adolescents who did not receive any additional care or attention relative to their normal-weight peers. The participants in the control group ($n = 32$) were recruited in three different ways. Firstly, adolescents from the RealFit waiting list ($n = 17$) were asked to participate in
the control group. Eight of them accepted. Secondly, the Youth Health Care recruited participants during regular health care contacts. If an adolescent was classified as overweight or obese, he/she was invited to participate in the control group (n = 20). They were not allowed to opt for the intervention group. Thirdly, the selection for the seventh RealFit group was done by randomisation (total of 19 interested adolescents: 15 adolescents were randomly selected for the RealFit intervention and four for the control group). The intervention and control groups used the same inclusion criteria and informed consent. The participants were included between February and June 2012. Thirty-two adolescents participated in the control group, 29 of whom completed at least two measurements.

**Outcome measurements**

**Self-esteem**
The Dutch version of the “Self Perception Profile for Adolescents” (Competentie Belevingsschaal voor Adolescenten [CBSA]) was used to measure self-esteem (Harter, 1986; Treffers et al., 2004). Participants filled out the questionnaire online or on paper immediately after their height and weight measurements. The questionnaire includes 35 items, in seven domains: scholar functioning, social acceptance, AA, PA, behavioural conduct, close friendship and GS. Every subscale includes five items. Each item presents two groups of persons who are dissimilar regarding a particular characteristic (e.g. “Some teenagers are satisfied with their figure”; “Some teenagers are not satisfied with their figure’). The participant is first asked to decide which group he or she most resembles. After this decision, the participant is asked to indicate whether the description is “really true for him/her” or “sort of true for him/her”. For each domain, a standardised score is calculated (range per subscale score: five to 20). The sum of all seven scores provides an indication of the adolescent’s overall self-esteem (range for total score: 35–140). Higher scores represent more positive self-esteem. Given the findings of Griffiths et al. (2010), only overall self-esteem and the AA, PA and GS domains were considered of interest for this study.

**Food craving**
The Dutch version of the “General Food Craving Questionnaire—Trait” (G-FCQ-T) is a valid and reliable questionnaire to assess the general degree of food craving and its consequences (Nijs et al., 2007). Participants filled out this questionnaire online or on paper immediately after their height and weight measurements. The G-FCQ-T (21 items) consists of four subscales: loss of control, the tendency to demonstrate disinhibited eating behaviour when exposed to cues; preoccupation with food, obsessively thinking about food and eating; positive outcome expectancy, believing that eating has a positive reinforcing effect; and emotional craving, the tendency to crave food when experiencing negative emotions. The participants indicated the degree to which each item was true for them in general, using a Likert scale from one (“never” or “not applicable”) to six (“always”). All subscales together resulted in a total score (range: 21–126) which provided an overall impression of the degree of general trait food craving, with higher scores indicating higher degrees of trait food craving.
**Statistical analysis**

Data were analysed using SPSS 21.0. The general characteristics of the intervention and control group participants were analysed using descriptive statistics. Pearson’s chi-square tests (for the dichotomous variables) and independent *t* tests (for the continuous variables) were conducted to compare the two groups at baseline. Multivariate linear regression analyses were conducted to examine the differences between the intervention and control groups at one-year follow-up compared with baseline, while controlling for confounders such as baseline and demographic variables. Alpha was set at 5%, whereas values between 5 and 10% were regarded as indicating a trend. Regression imputation was used to replace the missing values with the estimate derived from the imputation model (Donders, van der Heijden, Stijnen, & Moons, 2006).

**Results**

The participants in the RealFit intervention (*n* = 67; 25 boys) had a mean age of 14.1 years (range: 13–18 years), and had a significantly higher BMI *z*-score (*T* = 4.12, *p* < 0.001) and level of food craving (G-FCQ-T total score: *T* = −2.40, *p* = 0.019) at baseline than the control group (*n* = 29; 13 boys), which had a mean age of 13.6 years (range: 13–16 years) (Table 1). Multivariate regression analyses were used to control for these differences.

**Self-esteem**

Cronbach’s alpha was higher than 0.6 (scholar functioning = 0.622; social acceptance = 0.831; AA = 0.840; PA = 0.844; behavioural conduct = 0.845; close friendship = 0.823; GS = 0.786) in this study for all subscales of the CBSA, indicating that each subscale was consistently measuring similar aspects. The intervention and control groups both

<table>
<thead>
<tr>
<th>Table 1. Demographic and baseline characteristics of the intervention and control groups.</th>
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<td>---------------------------------------------------------------</td>
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<tr>
<td>Gender: boys (%)</td>
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<tr>
<td>Age (years)</td>
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<tr>
<td>Level of education (%)</td>
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<tr>
<td>Low&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>High&lt;sup&gt;d&lt;/sup&gt;</td>
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<tr>
<td>Different&lt;sup&gt;e&lt;/sup&gt;</td>
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<tr>
<td>Ethnicity: Dutch (%)</td>
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<tr>
<td>BMI (kg/m²)</td>
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<tr>
<td>BMI <em>z</em>-score</td>
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<tr>
<td>Obese or morbidly obese (%)</td>
</tr>
<tr>
<td>Self-esteem (CBSA total score)</td>
</tr>
<tr>
<td>Trait food craving (G-FCQ-T total score)</td>
</tr>
</tbody>
</table>

*Note: Data presented as percentages or as mean (± standard deviation). CBSA = Self Perception Profile for Adolescents (Competentie Belevingsschaal voor Adolescenten) (range: 35–140); G-FCQ-T = General Food Craving Questionnaire Trait (range: 21–126). |

<sup>a</sup>Trend. **Significant.  
<sup>b</sup>Pearson’s chi-square.  
<sup>c</sup>Variates not equal.  
<sup>d</sup>Lower secondary vocational education (Voorbereidend Middelbaar Beroepsonderwijs).  
<sup>e</sup>Higher general secondary education (Hoger Algemeen Voortgezet Onderwijs) or pre-university education (Voorbereidend Wetenschappelijk Onderwijs).  
<sup>f</sup>Primary school, anthroposophic school.
had significantly higher scores for overall self-esteem (CBSA total score) at one-year follow-up compared with baseline (mean difference [MD] = 12.21, \( p < 0.001 \) for the intervention group; MD = 7.04, \( p = 0.009 \) for the control group) (see Figure 1). Furthermore, Table 2 shows a significant increase for the AA, PA and GS domains in the intervention group one year after RealFit, compared with baseline (AA: MD = 1.19, \( p = 0.009 \); PA: MD = 3.08, \( p < 0.001 \); GS: MD = 3.05, \( p < 0.001 \)). Comparison between the two groups, controlling for confounders, showed a significant difference for the GS domain (\( B = 1.63; 95\% \) confidence interval [CI]: 0.28 to 2.99) in favour of the intervention group. PA (\( B = 1.43; 95\% \) CI: −0.09 to 2.94) and overall self-esteem (\( B = 4.55; 95\% \) CI: −0.90 to 10.01) showed a trend towards improvement. No significant difference was found for AA.

![Figure 1. Changes in self-esteem (CBSA total score).](image)

Table 2. Multivariate linear regression analyses of self-esteem and food craving.

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>Control</th>
<th>( B ) (95% CI)a</th>
<th>( P_{\text{adjusted}} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-esteem</td>
<td>AA</td>
<td>( \Delta T_3 - T_0 )</td>
<td>1.19 (±3.60)**</td>
<td>0.38 (±3.25)</td>
</tr>
<tr>
<td></td>
<td>PA</td>
<td>( \Delta T_3 - T_0 )</td>
<td>3.08 (±4.06)**</td>
<td>2.18 (±2.83)**</td>
</tr>
<tr>
<td></td>
<td>GS</td>
<td>( \Delta T_3 - T_0 )</td>
<td>3.05 (±3.76)**</td>
<td>1.14 (±3.00)**</td>
</tr>
<tr>
<td></td>
<td>CBSA total score</td>
<td>( \Delta T_3 - T_0 )</td>
<td>12.21 (±14.59)**</td>
<td>7.04 (±13.46)**</td>
</tr>
<tr>
<td>Trait food craving</td>
<td>G-FCQ-T total score</td>
<td>( \Delta T_3 - T_0 )</td>
<td>−7.22 (±17.18)**</td>
<td>−1.67 (±12.77)</td>
</tr>
</tbody>
</table>

Note: Data presented as mean (± standard deviation). AA = athletic achievements (range: five to 20); PA = physical appearance (range: five to 20); GS = global self-worth (range: five to 20); CBSA = Self Perception Profile for Adolescents (Competentie Belevingsschaal voor Adolescenten) (range: 35–140); G-FCQ-T = General Food Craving Questionnaire Trait (range: 21–126).

*Trend. **Significant.

aAdjusted for: age, gender, BMI z-score and baseline.
Cronbach’s alpha was higher than 0.6 (loss of control = 1.000; preoccupation with food = 0.993; positive outcome expectancy = 1.000; emotional craving = 1.000) for all subscales of the G-FCQ-T, indicating that the same construct was measured in each subscale. The changes over time regarding food craving (G-FCQ-T total score) showed a significant decrease in the intervention group one year after RealFit, compared with baseline (MD = 7.22, \( p < 0.001 \); Table 2 and Figure 2). Such a decrease was not observed in the control group. Comparison between the two groups, controlling for confounders, however, shows that the difference was not significant (\( B = 0.99; 95\% \) CI: $-5.21$ to $7.20$).

Discussion

The current study examined whether self-esteem had increased and food craving had decreased one year after participation in the RealFit programme, using a control group for comparison.

Self-esteem

A significantly greater increase for the GS domain was found in the intervention group compared with the control group (Figure 1 and Table 2). The difference for the PA domain was not significant, but it showed a trend towards improvement. The meta-analysis by Griffiths et al. (2010) found that these domains of self-esteem were consistently low in obese youngsters. Regardless of psychological classes, several studies have shown that weight-loss interventions per se may also indirectly improve self-esteem (French, Story, & Perry, 1995; Wang, Wild, Kipp, Kuhle, & Veugelers, 2009). It may thus have been the combination of all RealFit components which led to the favourable long-term effects in these self-esteem domains. Conversely, because psychological classes seem
essential to make a weight-loss intervention a success in the long term (Shaw et al., 2005), these classes may also have contributed to the favourable long-term results regarding BMI (Bartelink et al., 2014). A similar effect in the short term was found by Mulkens et al. (2007). In view of the effect of the psychological classes on both self-esteem and BMI, we recommend that weight-loss interventions include psychological classes.

**Food craving**

In the intervention group, food craving had significantly decreased one year after RealFit, compared with baseline. Such a decrease was not found in the control group. However, comparison with the control group using multivariate regression analyses showed no significant difference (Figure 2 and Table 2). Therefore, we cannot conclude that RealFit has a direct effect on food craving. This lack of effect may be explained by the fact that the RealFit programme did not spend enough time on cue exposure (only 1.5 hours in total). In addition, the delivery may not have been optimal, because the psychologist had to lead groups of 12 participants on average, and so was unable to closely control what everyone was doing. It may well be that participants secretly ate the food, which diminishes the effect of cue exposure (Conklin & Tiffany, 2002). Future research should investigate more appropriate methods to secure correct use of cue exposure in a group. Until then, we recommend using small groups (or even individual sessions) for the cue-exposure component, to optimise the effect of this part of the psychological classes.

**Limitations**

Several limitations need to be addressed for an appropriate evaluation of the results of this study. Firstly, the study was implemented in real-life circumstances. Although this is in fact a strong point, because interventions that are pilot-tested in real life have a greater chance of achieving implementation and dissemination when proven effective (Hohmann & Shear, 2002), real-life based research also involves measurement issues. These included the relatively small sample size, and the fact that it appeared difficult to keep participants motivated for the measurements after the RealFit intervention had ended. This impacted on the number of complete cases, necessitating the use of regression imputation.

A second limitation of this study is that the questionnaire was a subjective measurement, which can lead to social desirability bias. However, studies have shown that both of the questionnaires we used are reliable and valid (Nijs et al., 2007; Wichstraum, 1995). Thirdly, the baseline analyses showed some significant differences between the intervention and control groups, which may result from the fact that no full randomisation could be carried out. However, by controlling for baseline variables such as age, gender and BMI z-score in all analyses, we managed to eliminate at least the effect of the significant baseline differences in these factors.

**Conclusion**

Taking all results and limitations into account, it may cautiously be concluded that RealFit has beneficial long-term effects on some domains of self-esteem, but no substantial effect
on food craving. The appropriate duration and delivery of cue-exposure sessions in groups of overweight adolescents to decrease food craving should be investigated to further improve the RealFit intervention. Finally, because the sample size was relatively small, further research should be done to support the findings from this study.

**Disclosure statement**

No potential conflict of interest was reported by the authors.

**Funding**

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**Conflicts of interest**

Maria Jansen was involved in the development of RealFit and Sandra Mulkens developed the psychological component of RealFit.

**References**


