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Prevention Across the Spectrum: A randomized-controlled trial of three programs to reduce risk factors for both eating disorders and obesity

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Abstract

Background: A randomized-controlled trial (RCT) of 3 school-based programs and a no intervention control group was conducted to evaluate their efficacy in reducing eating disorder and obesity risk factors. **Methods:** *N* = 1,316 Grade 7 and 8 girls and boys (*M* age = 13.21 years) across three Australian states were randomly allocated to: *Media Smart; Life Smart; Helping, Encouraging, Listening and Protecting Peers Initiative* (*HELPP)* or control (usual school class). Risk factors were measured at baseline, post-program (5-weeks later), and 6- and 12-month follow-up. **Results:** *Media Smart* girls had half the rate of onset of clinically significant concerns about shape and weight than control girls at 12-month follow-up. *Media Smart* and *HELPP* girls reported significantly lower weight and shape concern than *Life Smart* girls at 12-month follow-up. *Media Smart* and control girls scored significantly lower than *HELPP* girls on eating concerns and perceived pressure at 6-month follow-up. *Media Smart* and *HELPP* boys experienced significant benefit on media internalization compared to control boys and these were sustained at 12-month follow-up in *Media Smart* boys. A group x time effect found *Media Smart* participants reported more physical activity than control and *HELPP* participants at 6-month follow-up, while a main effect for group found *Media Smart* participants reported less screen time than controls. **Conclusions:** *Media Smart* was the only program to show benefit on both disordered eating and obesity risk factors. Whilst further investigations are indicated, this study suggests that this program is a promising approach to reducing risk factors for both problems.

Keywords: prevention; eating disorders; obesity; risk factors

Introduction

In recent years there have been calls for a combined approach to eating disorder and obesity prevention with young-adolescents in school settings, due to the overlap in risk factors for both (Wilksch & Wade, 2009a; Austin, 2011). Dieting, body dissatisfaction, media use, depressive symptoms, and perfectionism have been found to increase the risk of both disordered eating and unhealthy weight gain (Stice *et al.*, 2005; Haines *et al.*, 2007; Neumark-Sztainer *et al.*, 2007). An intervention that can reduce these risk factors could have a preventative effect for both problems.

To date only one program has evaluated this approach with young-adolescent girls and boys in school settings, while a second program has been investigated with late-adolescent girls. Both programs were developed as obesity prevention programs but also measured eating disorder outcomes. *Planet Health* (Gortmaker *et al.*, 1999), a 2-year program for girls and boys in Grades 6-8, was found to reduce the growth of purging behaviors (vomiting, laxatives and diet pills: Austin *et al.*, 2005), by targeting traditional obesity prevention goals: reduced television viewing and consumption of high-fat foods, increased fruit and vegetable intake and physical activity levels. However this program was not included in the current RCT as the aim was to evaluate lower intensity programs (i.e., 8-lessons in duration) that might be more readily introduced in school settings. The *Healthy Weight* program (Stice *et al.*, 2008) reduced the risk of eating pathology by 61% and obesity by 55% in female university and high-school students with high levels of body concern relative to controls over a three-year follow-up. This was not a classroom-based program but a three-hour intervention that targeted traditional obesity prevention goals (e.g., healthy eating and physical activity) in small groups. This program was deemed not suited to the young-adolescent sample in the current study given its explicit focus on eating and exercise, where younger participants in a universal setting might not benefit from such a direct approach.

Life Smart, an 8-lesson program for early-adolescent girls and boys, was developed and pilot tested in preparation for the current RCT as a program to reduce obesity risk factors (Wilksch & Wade, 2013). A central theme is that health is comprised of more than just weight, eating and exercise, including content related to physical activity, sleep, thinking styles, managing emotions and social support, thus addressing weight gain risk factors beyond the traditional targets. In the pilot study, a significant effect was found for shape and weight concern but in the absence of a follow-up, it was not possible to meaningfully assess the impact on body mass index (BMI).

It is also feasible that existing eating disorder prevention programs might promote better health outcomes. Two such programs were investigated in this study. The first, *Media Smart* targets media internalization, an eating disorder risk factor which refers to investment in societal ideals of size and appearance to the point that they become rigid, guiding principles. This is a prospectively identified risk factor that has been found to lead to eating pathology both directly (Field *et al.,* 1999) and through the dual-pathway model of bulimic pathology (Stice, 2001). *Media Smart* has been evaluated through a program of Australian research involving a pilot study (N = 237 girls and boys; Wilksch *et al.*, 2006), a RCT over a 2.5-year follow-up (N=540 girls and boys; Wilksch & Wade, 2009b), supplementary analyses of this RCT by participant risk status (Wilksch, 2010), exploration of moderators of outcome in this RCT (Wilksch & Wade, 2014), and a controlled effectiveness trial examining delivery by usual classroom teacher (Wilksch, 2013). The RCT revealed significant benefits to *Media Smart* participants on a range of risk factors with girls having significantly lower shape and weight concern scores at 2.5-year follow-up than their control counterparts. Weight concern is considered the most robust and proximal eating disorder risk factor (McKnight Investigators, 2003; Jacobi & Fittig, 2010). There were also significant effects for body dissatisfaction, depression, and dieting which have also been found to increase the risk of obesity (e.g., Franko *et al.*, 2005; Neumark-Sztainer *et al.*, 2007).

The second program is *Happy Being Me,* a 3-lesson program that has been evaluated in controlled trials with Grade 7 Australian girls (N =194: Richardson & Paxton, 2010) and with Grade 5 and 6 girls and boys from the UK (N = 88: Bird *et al.*, 2013). The program addresses the eating disorder risk factors of internalization of social appearance ideals and appearance comparisons, which have been prospectively linked with increases in body dissatisfaction, dieting, bulimic symptoms and disordered eating (Stice, 2001; Paxton *et al.*, 2006). The first study found significant benefits at 3-month follow-up for body dissatisfaction, media internalisation, dieting, appearance conversations, appearance teasing, and self-esteem. The British trial found girls experienced benefits at 3-month follow-up for body satisfaction and media internalization. For the purpose of the current trial this program was extended to 8-sessions, including components on eating concerns, and was called the *Helping, Encouraging, Listening and Protecting Peers Initiative* (*HELPP).*

The aim of this research was to investigate the efficacy of an obesity prevention program (*Life Smart*) and two eating disorder prevention programs (*Media Smart* and *HELPP)* against each other and a no-intervention control condition with young-adolescent girls and boys from pre- to post-intervention and over a 12-month follow-up. The primary outcome variables were weight concerns and BMI, whilst secondary outcome

variables included risk factors for eating disorders (e.g., eating concerns, media internalization) and obesity (e.g., physical activity, screen time).

Methods

Participants

A total of 1, 316 Grade 7 and Grade 8 girls (n = 840; 64%) and boys (n = 476) from 12 schools, across three Australian states (South Australia n = 355; Victoria n = 467; Western Australia n = 494) participated (M age = 13.21 years; SD = .68). In each school, one Grade was the intervention year level (e.g., Grade 7) while the other Grade (e.g., Grade 8) served as no-intervention control participants who would attend their usual classes. Classes in the intervention Grade were randomly allocated to one of the three programs. Where the intervention Grade had at least three classes, each class would receive a different program. This approach of randomization of class (rather than school) is informed by Cochrane Review recommendations that this is a more methodologically rigorous approach than randomization based on school, given that students within the same school are thought to be more alike than compared to other schools (Pratt & Woolfenden, 2002). While this approach might carry the risk of students from differing classes in the same school discussing their respective program content leading to contamination effects this could be considered to strengthen confidence in any observed differences between the programs given this contamination effect would make the groups more similar on outcome measures. A higher proportion of control students were from Grade 8 (73%) rather than Grade 7 (27%), while a higher proportion of intervention participants were in Grade 7 (70%) rather than Grade 8 (30%). The balance of intervention participants in each grade was approximately: *Life Smart* (40%); *Media Smart* (30%); and *HELPP* (30%).

Ten schools were co-educational (girls and boys n = 1169; 89%) and two were girls-only (n = 147; 11%). Schools were public (n = 3); private (n = 4) and Catholic (n = 5), where the latter are typically considered more similar to public schools in regard to sociodemographic factors. Classes participated with recruitment, interventions and outcome assessments between May, 2011 and July, 2013. Whilst information relating to participant race and ethnicity was not collected, socioeconomic status was obtained from the Australian government's Index of Community Socio-Educational Advantage (ICSEA) whereby 1000 represents the mean, with a standard deviation of 100 (Australian Curriculum, Assessment and Reporting Authority, 2011). The mean ICSEA rating was 1104 (range = 972 – 1183), indicating above average socio-economic advantage, consistent with anecdotal reports from program presenters suggesting a predominantly Caucasian sample as reflecting Australian society.

Procedure

Approval for this research was received from five Institutional Review Boards and each school principal. Schools were invited to participate based on a staff member previously expressing an interest in body image programs (*n*=4) or where schools were geographically located within one hour of the participating university in that state (*n*=8). Allocation of Grade (7 and 8) to either programs or control condition was completed at random, as was allocation of individual intervention classes to the respective programs. As can be seen from **Figure 1**, 12 schools agreed to participate. Following parental consent for assessment completion, students completed baseline questionnaires and then had health assessments (height, weight and blood pressure) completed in private by two research assistants. Care was taken to ensure that participants were not able to view their measurements in order to protect against any possible iatrogenic effects. Students in an intervention would then receive their allocated program over the following four weeks, while control students would participate in their usual class lessons. Assessments were then completed at post-program and 6- and 12-month follow-up.

Interventions

All three programs were developed around the evidence-based principles of being interactive; avoiding psychoeducation about eating disorders and obesity; and having multiple sessions (Stice *et al.*, 2007) with 8-lessons of 50-minutes duration delivered at the rate of two lessons per week. **Table 1** provides example learning activities from each program and the risk factors targeted. It can be seen that *Media Smart* and *HELPP* targeted similar eating disorder risk factors, while *Life Smart* targeted a wider range of both shared and obesity risk factors. The programs were presented by postgraduate psychology students who had attended a training session run by the program developers covering principles of effective program delivery followed by three two-hour workshops for each intervention. Presenters received training in all three programs and were required to deliver each program in order to reduce the likelihood of presenter effects contaminating program outcomes.

Measures

Eating disorder risk factor measures were selected based upon the evidence supporting their construct validity (e.g., Garner *et al.*, 1983; Fairburn & Beglin, 1994; Thompson *et al.*, 2004) and use in previous prevention trials with early-adolescents (Wilksch *et al.*, 2008; Wilksch & Wade, 2009b), while weight gain risk factor measures were selected based upon their use in large-scale longitudinal risk factor studies; Project Eating Amongst Teens (Haines *et al.*, 2006) and the Growing Up Today Study (Field *et al.*, 2003). All measures had good internal reliability in the current study (see **Table 2**), with the exception of Eating Concerns for boys

(retained for use in the analyses for girls only). Higher scores indicated higher levels of risk for all but the regular eating and physical activity scales, where higher scores indicated lower levels of risk.

Statistical Analyses

Baseline data. Baseline differences across the four groups were analyzed separately for girls and boys using ANOVAs with an alpha level of .05. Effect sizes for post-hoc between-group differences at baseline were calculated using Cohen's *d* (*mean of group 1 – mean group 2 / (pooled SD group 1 and group 2)*), where .2 = small, .5 = moderate, .8 = large.

Repeated Measures for Risk Factors and Health Assessments. Linear mixed model analyses were conducted to assess the efficacy of the three programs, compared to the control condition and each other. To assess for main effects and interactions involving group (group X time X gender; group X time), baseline observations were used as a covariate to ensure that any observed effects were due to changes at post-program and follow-up and not due to variation in scores at baseline or measurement error. This involved a 4 (group: *Media Smart*, *Life Smart*, *HELPP*, Control) X 3 (time: post-program, 6-month follow-up; 12-month follow-up) X 2 (gender: girls, boys) mixed within-between design. This approach allows for direct comparisons between the groups at post-program and follow-up assessments. The alpha level for testing for main effects and interactions was .05 with Bonferroni-adjusted post-hoc analyses, and Cohen's *d* between group effect sizes reported for significant comparisons. This methodology was also employed to investigate outcomes by state and school class to investigate any impact of site on the results.

Due to requirements imposed by an IRB, participant names were not recorded at assessment points but instead, participants answered a series of questions (e.g., "What is the first letter of your mother's name?") to generate a uniquely identifying code at each assessment point to match over each wave of data collection. A three wave minimum match criterion (75% of possible observations) was used to avoid any inadvertent duplicate data that would result from within-participant errors within and across waves using this approach. Thus while *N* =1,441 participants completed baseline measures, the analyses were conducted with a total sample of *N*= 1,316 participants or 91% of the baseline sample. The proportion of missing data was consistent across the four groups and logistic regression analyses showed there were no baseline differences on our primary outcome variables between participants who completed a minimum of three waves of data collection and those who did not: weight concerns (OR=1.09, 95% CI [0.90-1.33]) and BMI (OR=0.98, 95% CI [0.95-1.02]).

Clinical significance. We explored the frequency of participants who developed clinical levels of shape concern or weight concern by 12-month follow-up. This was defined as a mean item shape concern or

weight concern of ≥ 4 as this is considered indicative of clinical levels of concern (Fairburn & Beglin, 1994) and suggestive of current or future disordered eating (Gowers & Shore, 2001). Participants with clinical levels of concern at baseline were excluded from this analysis (*N* = 128 girls [15%]; 10 boys [2%]). Logistic regressions examined differences in the proportion of new cases of clinical concern between the groups for girls and boys. Baseline level of clinical shape and weight concern was entered at step 1 and group allocation at step 2, where this was conducted separately for girls and boys. The same procedure was applied to participants' weight status using a combined variable of overweight and obesity (BMI percentile ≥ 85) with those participants meeting this criterion at baseline excluded (*N* = 160 girls [20%]; 77 boys [17%]).

Results

Baseline Measures

Investigating baseline scores by group and gender revealed significant differences between groups for girls on regular eating (F[3, 769]=5.40, p=.001) and BMI (F[3, 808]=3.71, p=.011). Post-hoc analyses showed that control girls (*M* = 4.55; *SD* = .57) were eating more regularly than *Life Smart* (*M* = 4.39; *SD* = .69 [ES= .25]), and *HELPP* girls (*M* = 4.28; *SD* = .86 [ES= .39]). *Media Smart* girls (*M* = 19.78; *SD* = 3.42) had a significantly lower BMI than *HELPP* girls (*M* = 21.01; *SD* = 3.76 [ES= .33]). The only significant group baseline difference for boys was for perfectionism (F[3, 424]=3.20, p=.023), where *Media Smart* boys (*M* = 1.87; *SD* = .73) scored significantly lower than control boys (*M* = 2.17; *SD* = .79 [ES= .38]).

Repeated Measures for Risk Factors and Health Assessments

Interactions between group, time and sex Results are presented in **Table 3** for girls and boys, where effect sizes are reported for significant between-group comparisons for participants of the same gender. Significant group X time X gender interactions were found for weight concern (F[8, 968]=5.00, p<.001), shape concern (F[8, 952]=3.85, p<.001), eating concern (F[8, 775]=3.15, p=.002), body dissatisfaction (F[8, 1048]=4.06, p<.001; ES = .17), dieting (F[8, 1057]=4.49, p<.001), media internalization (F[8, 1076]=2.22, p=.024), depression (F[8, 1024]=2.28, p=.021), weight-related teasing (F[8, 1031]=2.32, p=.018), perfectionism (F[8, 1061]=2.44, p=.013), perceived pressure (F[8, 805]=3.92, p<.001), and regular eating (F[8, 1018]=1.98, p=.046). **Table 3** indicates that for weight concern and shape concern, both *Media Smart* and *HELPP* girls scored significantly lower than *Life Smart* but not control girls at 12-month follow-up. For eating concern, both *Media Smart* and control girls scored significantly lower than *HELPP* girls at 6-months while control girls scored lower than *Life Smart* girls at 12-months. On perceived pressure, both *Media Smart* and control girls scored significantly lower than *HELPP* at 6-months.

For boys, *Media Smart* participants showed significant benefits at post-program for body dissatisfaction, media internalization, weight-related peer teasing, perfectionism, and at 6-month and 12-month follow-up for media internalization and depression. The only significant benefit experienced by *Life Smart* boys was on body dissatisfaction at post-program, while these boys had significantly higher levels of media internalization at post-program and 6-month follow-up and higher levels of depression at 6-month and 12-month follow-up. *HELPP* boys experienced significant benefits on media internalization at post-program and 6-month follow-up and on depression at 6-month follow-up, however *HELPP* boys reported significantly higher levels of being a victim of weight-related peer teasing than *Media Smart* boys at post-program.

Interactions between group and time. A group X time interaction was found for physical activity (F[6, 1097]=3.51, p=.002), where *Life Smart* participants (M=1.58, SE=.02) scored significantly higher than control participants (M=1.50, SE=.02; [ES =.23]) at post-program while *Media Smart* participants *(*M=1.59, SE=.02) scored significantly higher than both *HELPP (*M=1.49, SE=.03; [ES =.28]) and control participants *(*M=1.49, SE=.02; [ES =.27]) at 6-months.

Main effect of group. A main effect for group was found for screen time [F(3, 1088)=3.42, p=.017], where the *Media Smart* group (M=1.57, SE=.02) had a significantly lower mean score (across post-program, 6-month- and 12-month follow-up assessment points) than the control group (M=1.63, SE=.01 [ES=.20]).

Impact of state and school class

Significant differences across states were found for regular eating (F[2, 1165]=5.37, p=.005), and screen time (F[2, 1087]=5.29, p=.005), where in both cases, this was due to differences between South Australian and Victorian participants (mean score across the post-program and follow-up assessment points). Post-hoc testing revealed that: *HELPP* participants in South Australia (M=4.54, SE=.08) were eating significantly more regularly (i.e., skipping fewer meals) than *HELPP* participants in Victoria (M=4.30, SE=.08 [ES =.33]); and *Life Smart* participants in both South Australia (M=1.61, SE=.03 [ES =.27]) and Western Australia (M=1.54, SE=.03 [ES =.51]) had significantly lower screen time than *Life Smart* participants in Victoria (M=1.70, SE=.03). The Victorian schools were public schools, whereas those in South Australia and Western Australia were Catholic or private schools.

Dieting (F[26, 1100]=1.66, p=.021) and screen time (F[26, 1010]=1.55, p=.040) were the only variables where a significant effect for school class was found. Post-hoc testing showed no differences for dieting while for screen time the significant difference occurred between a school class in Victoria and one in Western Australia, consistent with the effect of state for this variable.

Clinical significance

Of participants with 12-month follow-up data (*n* girls = 653; *n* boys = 365), a total of 82 girls (12.5%) developed clinical levels of concern about shape and weight by 12-month follow-up, while just 7 boys (1.9%) experienced such an increase. **Table 5** provides the frequency and percentage of participants from each condition that developed these concerns by 12-month follow-up. A logistic regression revealed that *Media Smart* girls had half the likelihood of control girls of developing clinical levels of shape and weight concern (β= .51 ; 95% CI .28-.94, p = .030), while the comparisons for the other two programs with the control group were not significant. The same procedure was applied to participants' weight status (BMI percentile ≥ 85) and at 12-month follow-up there were no significant differences across groups in new cases for either girls or boys.

Discussion

The aim was to assess whether one or more of the programs could reduce risk factors for *both* disordered eating and obesity. For the primary outcome variable of weight concerns, a significant effect at 12-month follow-up was shown where both *Media Smart* and *HELPP* girls had significantly lower concerns relative to *Life Smart* but not control girls. However, *Media Smart* girls had significantly lower incidence of new cases (8%) with clinical concerns about shape and weight at 12-month follow-up compared to control girls (19%). No significant differences were found for the other primary outcome variable, BMI. Across secondary outcomes variables, a range of significant effects were found, however many of these were due to comparisons between interventions rather than with the control group. Physical activity was the only variable where girls in an intervention group (*Media Smart)* reported significantly lower risk than the control group (post-program and 6-month follow-up), while a significant *increase* in risk was found relative to the control group for both *HELPP* girls (eating concern and perceived pressure at 6-month follow-up) and *Life Smart* girls (eating concern at 12-month follow-up). For boys, an intervention group experienced significant benefit relative to the control group for body dissatisfaction (*Media Smart* and *Life Smart* at post-program), media internalization (*Media Smart* at each time point, *HELPP* at post- and 6-month follow-up) and perfectionism (*Media Smart* at post-program). However, *HELPP* boys reported significantly lower levels of physical activity at 12-month follow-up than control boys. Taken collectively, there were four key findings that emerged from this RCT.

First, the 12-month follow-up findings for both *Media Smart* and *HELPP* for weight and shape concerns were promising given this is one of the most important risk factors for disordered eating (McKnight Investigators, 2003; Jacobi & Fittig, 2010). The finding that *Media Smart* girls had half the rate of onset of control girls of clinical concerns about shape and weight at 12-month follow-up provides a step towards the

clinically relevant outcomes investigated in targeted prevention trials (e.g., Taylor *et al.*, 2006) and adds to the previous 2.5-year follow-up where girls had significantly lower weight concerns than controls (Wilksch & Wade, 2009a). This was the first time the impact of *HELPP* (or *Happy Being Me*) had been evaluated on shape concern and weight concern and thus this result requires further investigation.

Second, a clear pattern emerged where *Media Smart* participants experienced significant benefit on more variables than other interventions for both girls (5 variables, 7 post-hoc comparisons) and boys (6 variables, 10 post-hoc comparisons). Whilst only six of these findings were present at 12-month follow-up, *Media Smart* girls and boys were the only group to not experience a significant increase in risk relative to another group on any variable. Possible explanations for the positive findings for *Media Smart* in this and previous studies include: it is concise and focuses on fewer risk factors ensuring content is thoroughly learned where this might be more effective than targeting multiple risk factors with less time spent on each (e.g., *Life Smart)*; it strikes a balance between relevant learning content without providing detail about potentially risky topics (e.g., in-depth analysis of appearance-based conversations); media is a topic of interest to both girls and boys that is well-suited to the age group investigated. It was also an important finding that *Media Smart* participants were engaging in more physical activity than *HELPP* and control participants at 6-month follow-up. Although these significant differences did not continue to 12-month follow-up, the findings suggest the potential for an eating disorder prevention program to show benefits to other health outcomes. We also found that *Media Smart* encouraged participants to spend less time consuming screen media in general. These findings suggest a longer term efficacy RCT to assess the impact on weight gain is indicated, as is an effectiveness RCT involving usual school teachers delivering the program, as well as replication by an independent research team (Becker *et al.*, 2008).

Third, this was the first time the 8-lesson *HELPP* program was evaluated, rather than the 3-lesson *Happy Being Me* from which *HELPP* was developed, and the first time any version was evaluated beyond a 3-month follow-up. Whilst *HELPP* produced significant benefits for girls (weight and shape concern) and boys (media internalization and depression), only one of these was against the control group (boys on media internalization), with the remainder compared to *Life Smart*. Conversely, *HELPP* produced significantly poorer outcomes than the control group on two variables for girls at 6 month follow-up (eating concern and perceived pressure to be thin) and on physical activity for boys at 12-month follow-up, whilst there were further variables where *HELPP* had poorer outcomes than *Media Smart* (e.g., screen time for boys at 12-month follow-up). One reason for the difference on Eating Concerns at 6-month follow-up is that *HELPP* specifically included classes

on healthy eating and mindful eating. It is possible that while these are helpful aspects to address in high risk groups, they may draw unwarranted attention to eating behaviors in young universal samples. Further efficacy trials over longer follow-up periods are required to tease out why increased scores on some risk factors might be occurring and whether helpful impacts are sustained. The mixed outcomes of the current trial were not consistent with the previous evaluations (Richardson & Paxton, 2010; Bird *et al.*, 2013). Given the earlier studies were conducted with younger children it is possible the content may be more suited to this age group. Results suggest that *HELPP* is not suited to obesity prevention, and further evaluations are required to understand pattern of change over time.

Fourth, with the exception of body dissatisfaction at post-program for boys, *Life Smart* did not result in lower eating disorder or obesity risk and indeed girls recorded worsened scores on four variables, while boys reported increased risk on three variables relative to the other interventions. Whilst only one of these differences was in comparison to the control group (i.e., eating concern for girls at 12-month follow-up), the program clearly showed insufficient value. It is not immediately apparent as to the reason for these outcomes, especially given the positive findings for weight concerns in the pilot study (Wilksch & Wade, 2013). Given that *Life Smart* was developed to prevent obesity through a thoughtful lens to body image, it does raise the question of how other obesity prevention programs (developed without these considerations) might impact upon eating disorder risk factors. It is rare for obesity prevention programs to measure potential harm (Carter & Bulik, 2008) and these results indicate that such evaluations should be required.

Six limitations were present in this study. First, apart from Eating Concerns, disordered eating was not measured due to previous experiences of the researchers that some parents have concerns regarding their child completing such measures, even though research suggests these questions are of minimal risk (Celio *et al.*, 2003). Second, it would have been preferable to have more objective measures of dieting and physical activity. Third, the method of coding of participants imposed by an ethics review board interfered with accurately matching participants across waves. However, this issue was managed conservatively, resulting in strong confidence as to the accuracy of matching. Fourth, despite the use of randomization, baseline differences were found and were conservatively managed with the use of these scores as a covariate, although it is preferable for randomization to ensure no pre-existing differences. Fifth, independent adherence assessments of presenter program fidelity were not completed. Finally, the follow-up period was shorter than some universal eating disorder prevention trials (Wilksch & Wade, 2009b ; González *et al.*, 2011).

There were also strengths of this study, including the: evaluation of multiple programs; effort to replicate previously evaluated programs; large sample size; inclusion of multiple sites to increase external validity; delivery by non-specialist presenters; and, inclusion of clinically-relevant outcomes. Overall, these results indicate that universal prevention might be a promising and relatively low intensity approach to reducing risk factors for both problems.

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Declaration of Interest: Dr Wilksch and Professor Wade are authors of *Media Smart*, where sales of the program fund further eating disorder prevention research. Professor Susan Paxton is an author of the *HELPP* program and is currently a consultant to Dove, Unilever.

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Table 1.

Overview of the three programs including example activities from each lesson and risk factors targeted

Media Smart	***Life Smart***	***HELPP***
1. Stereotypes: We are not all the same - Examine magazines for advertisements that stereotype men, women and lifestyle then make poster to 'send-up' these stereotypes	*1. Health: There's more to it than you might think!* - Introduction to Life Smart pie chart: Physical, mind and social health	*1. Appearance ideals* - Introduction to appearance ideals and their sources and exploration of ideas to resist appearance pressure
2. Media advertising: What tactics are used? - DVD showing even models aren't 'good enough' how they naturally appear – show tape, pegs etc	*2. Physical health: Fuelling our health* - Small group presentations aimed at convincing young people to follow one of 4 healthy eating tips	*2. Appearance pressure and teasing* - Brainstorming responses to teasing; class rules, actions of bystanders, actions of friends
3. Pressure: Who places pressure on us and what can we do about it? - Individual: What qualities do we admire in ourselves?	*3. Physical health: Adding rest and play to our health* - Small group: Helping a friend struggling to get enough sleep or exercise	*3. Appearance conversations* - Introduction to "fat-talk" (appearance conversations) and their negative consequences; generating constructive responses
4. Pressure: Looking after ourselves and our peers - Pairs: Providing advice to younger peer on how to protect oneself from the pressures from the media	*4. Healthy thinking!* - Identifying unhelpful thinking styles: class discussion and DVD clip	*4. Appearance conversations and food talk* - Role play alternatives to appearance conversations and food talk

5. Putting pressure on the media: Praising the good and protesting the bad - Pairs: Email either praise or protest letters to advertisers who convey healthy/unhealthy messages.	*5. Emotions: What do they do for us and how can we handle them?* - Small group: What can we do with strong emotions?	*5. Media literacy and media pressure* - Identification of media manipulation techniques and strategies to resist media pressure
6. Is advertising harmful: What do you think? Part I - Small group preparation for a presentation in lesson 7: "Is advertising harmful?"	*6. Family & friends: How do they affect our health?* -Small group: Making connections with safe people	*6. Appearance comparisons* - Role plays: exploration of strategies to get out of the "comparison trap"
7. Is advertising harmful: What do you think? Part II - Class discussion of concepts raised in each group presentation	*7. How to be life smart: What do you think?* - Small group preparation for a presentation in lesson 8: "If someone is overweight, they are unhealthy – agree or disagree?"	*7. Eating concerns* - Brainstorming solutions to eating concerns and mindful eating experiential activity
8. Where to from here? (Bringing it all together) - How to deal with "I know it's fake but I still want to look like it"	*8. Where to from here? Bringing it all together and looking to the future* - Class discussion: the choices we have and program review	*8. Review – Challenging appearance ideals* - Dissonance activity to counter appearance ideals and review of program messages
Risk factors targeted: media internalization (ED), perceived pressure to be thin/muscular (ED), weight concern (B)	***Risk factors targeted:*** dieting (B); meal skipping (B), physical activity (B); sleep (O); perfectionism (B); emotion regulation (B); social support (B)	***Risk factors targeted:*** media internalization (ED); perceived pressure to be thin/muscular (ED); appearance comparisons (ED); dieting (B)

Note Risk factor definitions: B = both (i.e. both eating disorder and obesity); ED = eating disorder; O = obesity

Table 2.

Summary and description of self-report measures

Variable	Description (Cronbach's alpha) and example item
Weight concern	Eating Disorder Examination – Questionnaire (Fairburn & Beglin, 1994), 7 items (Girls α =.89; Boys α =.85)
	e.g., *How dissatisfied have you been with your weight?*, 0 = "Not at All" to 6 = "Marked"
Shape concern	Eating Disorder Examination – Questionnaire (Fairburn & Beglin, 1994), 6 items (Girls α =.92; Boys α =.89)
	e.g., *How dissatisfied have you been with your shape?*, 0 = "Not at All" to 6 = "Marked"
Eating concern	Eating Disorder Examination – Questionnaire (Fairburn & Beglin, 1994), 5 items (Girls α =.81; Boys α =.60)
	e.g., *Over the past 28 days, how many days have you eaten in secret?*, 0 = "No days" to 6 = "Every day"
Dieting	Dutch Eating Behaviour Questionnaire – Restraint (Van Strien *et al.*, 1986), 10 items (Girls α =.93; Boys α =.89)
	e.g., *Do you deliberately eat foods that are slimming?*, 1 = "Never" to 5 = "Very Often"
Body dissatisfaction*	Eating Disorder Inventory (EDI: Garner *et al.*, 1983) Body Dissatisfaction 9 items (Girls α =.90; Boys (Hallsworth *et al.*, 2005) α =.84)
	e.g., *I think that my stomach is too big*, 6= "Always" to 1 = "Never"
Media internalization*	Sociocultural Attitudes Towards Appearance Questionnaire-3 (Thompson *et al.*, 2004), 9 items (Girls α =.95; Boys (Wilksch & Wade, 2012) α =.94)
	e.g., *I compare my body to the bodies of TV and movie stars*, 1= "definitely disagree" to 5 = "definitely agree"

Perceived pressure*	Perceived Sociocultural Pressure Scale (Stice *et al.*, 1996), 8 items (Girls α =.88; Boys α =.91)
	e.g., *I've felt pressure from my family to lose weight*, 1= "none" to 5 = "A lot"
Depression	Child Depression Inventory –Short Form (Kovacs, 1992), 10 items (Girls α =.87; Boys α =.83)
	e.g., 0 = "*I am sad once in a while*" to 2 = "*I am sad all the time*".
Weight-related peer teasing	McKnight Risk Factor Survey (Shisslak *et al.*, 1999), 8 items (Girls α =.93; Boys α =.92)
	e.g., *In the past year, how often have girls/young women (including sisters) made fun of you because of your weight?*, 1= "Never" to 5 = "Always".
Perfectionism	Multidimensional Perfectionism Scale: Concern over mistakes (Frost *et al.*, 1990), 9 items (Girls α =.89; Boys α =.89)
	e.g., *If I fail partly, it is as bad as being a complete failure*, 1 = "strongly agree" to 4 = "strongly disagree
Regular eating	Project EAT (Haines *et al.*, 2006) Regular meals (3 items)
	e.g., *During the past week, how many days did you eat lunch?*, 1 = "Never" to 5 = "Always"
Screen time	GUTS - Screen time (Field *et al.*, 2003) (Mean weekday and weekend hours: TV, DVD, Internet/Computer, Nintendo/ Playstation), 8 items.
	e.g., *On school days, how many hours (when you are not at school) do you USUALLY spend watching TV?*, 1 = "0-1 hours" to 3 = "4-6 hours"
Physical activity	GUTS - Physical activity (Field *et al.*, 2003) (Mean weekday and weekend hours of playing outside, competitive sport, bike riding) 6 items.
	e.g., *On the weekend (Saturday and Sunday), how many hours do you USUALLY spend playing outside?*, 1 = "0-1 hours" to

3 = “4-6 hours”

Note * = These scales had one or more items that differed for girls and boys

Table 3

Mixed models estimated marginal means for eating disorder risk factors by group (4) and time (3) for girls

Measures (baseline covariate value)	Post-Program					6-Month Follow-Up					12-Month Follow-Up				
	MS M (SE)	LS M (SE)	HP M (SE)	Cont M (SE)	Significant Contrasts (ES)	MS M (SE)	LS M (SE)	HP M (SE)	Cont M (SE)	Significant Contrasts (ES)	MS M (SE)	LS M (SE)	HP M (SE)	Cont M (SE)	Significant Contrasts (ES)
GIRLS															
Weight Concern[a,c]	1.73	1.79	1.89	1.88	-	1.90	1.99	2.04	2.06	-	2.12	2.54	2.00	2.27	MS<LS (.34)
(1.88)	(.09)	(.07)	(.10)	(.07)		(.10)	(.08)	(.10)	(.08)		(.11)	(.09)	(.13)	(.08)	HELPP<LS (.43)
Shape Concern[c]	1.94	1.96	2.07	2.00	-	2.05	2.23	2.14	2.25	-	2.31	2.76	2.18	2.46	MS<LS (.33)
(2.07)	(.08)	(.07)	(.10)	(.07)		(.10)	(.08)	(.11)	(.08)		(.12)	(.10)	(.14)	(.09)	HELPP<LS (.42)
Eating Concern[c]	.46	.67	.64	.64	-	.63	.81	1.05	.74	MS<HP (.47)	.82	1.08	.89	.73	C<LS (.33)
(0.65)	(.07)	(.06)	(.09)	(.06)		(.08)	(.07)	(.09)	(.07)	C<HP (.35)	(.09)	(.08)	(.11)	(.07)	
Dieting[c]	2.10	2.13	2.11	2.21	-	2.17	2.23	2.31	2.24	-	2.38	2.45	2.24	2.34	-
(2.22)	(.05)	(.05)	(.07)	(.05)		(.06)	(.05)	(.07)	(.05)		(.07)	(.06)	(.08)	(.05)	
Body Dissatisfaction[b,c]	2.77	2.73	2.82	2.89	-	2.93	2.87	2.87	3.01	-	3.11	3.20	2.87	3.17	-
(2.78)	(.10)	(.10)	(.10)	(.09)		(.10)	(.10)	(.11)	(.10)		(.11)	(.10)	(.13)	(.10)	
Media Internalization[a,b,c]	2.21	2.31	2.31	2.38	-	2.35	2.39	2.37	2.52	-	2.56	2.63	2.40	2.61	-

(2.43)	(.06)	(.05)	(.07)	(.05)		(.06)	(.06)	(.07)	(.05)		(.07)	(.06)	(.08)	(.06)	
Perceived Pressure[c]	1.57	1.56	1.55	1.56	-	1.59	1.69	1.88	1.59	MS<HP (.45)	1.89	1.90	1.90	1.72	-
(1.53)	(.06)	(.05)	(.08)	(.05)		(.06)	(.05)	(.07)	(.05)	C<HP (.44)	(.07)	(.06)	(.08)	(.06)	
Depression[a,c]	.30	.28	.27	.32	-	.37	.33	.34	.32	-	.42	.42	.37	.43	-
0.31	(.03)	(.02)	(.03)	(.02)		(.03)	(.02)	(.03)	(.02)		(.05)	(.03)	(.05)	(.03)	
Weight-related peer	1.49	1.54	1.59	1.62	-	1.69	1.68	1.74	1.69	-	1.74	1.84	1.73	1.73	-
Teasing[a,c]	(.05)	(.04)	(.06)	(.04)		(.06)	(.05)	(.07)	(.05)		(.06)	(.05)	(.08)	(.05)	
(1.63)															
Perfectionism[c]	2.02	2.03	1.99	2.14	-	2.14	2.07	2.04	2.12	-	2.23	2.30	2.16	2.20	-
(2.10)	(.06)	(.05)	(.07)	(.05)		(.06)	(.05)	(.07)	(.05)		(.06)	(.05)	(.07)	(.05)	
Regular eating[c]	4.44	4.45	4.39	4.48	-	4.37	4.40	4.29	4.37	-	4.43	4.33	4.22	4.41	-
(4.49)	(.05)	(.05)	(.06)	(.04)		(.05)	(.04)	(.06)	(.04)		(.06)	(.05)	(.07)	(.05)	
Screen Time[a]	1.54	1.55	1.58	1.58	-	1.53	1.61	1.61	1.54	-	1.56	1.57	1.58	1.57	-
(1.54)	(.03)	(.02)	(.03)	(.02)		(.03)	(.03)	(.03)	(.02)		(.03)	(.03)	(.04)	(.03)	
Physical Activity[b]	1.55	1.53	1.53	1.45	MS>C (.31)	1.57	1.47	1.50	1.42	MS>LS (.31)	1.50	1.48	1.49	1.46	-
(1.48)	(.03)	(.02)	(.03)	(.02)		(.03)	(.03)	(.03)	(.02)	MS>C (.44)	(.03)	(.04)	(.03)	(.02)	
BMI	20.18	20.09	19.93	20.09	-	20.34	20.33	20.10	20.26	-	20.79	21.05	20.84	21.04	-
(20.01)	(.09)	(.07)	(.10)	(.07)		(.09)	(.08)	(.10)	(.08)		(.13)	(.11)	(.15)	(.10)	

BOYS															
Weight Concern[a,c]	1.50	1.75	1.48	1.86	-	1.50	1.63	1.45	1.55	-	1.48	1.65	1.52	1.68	-
(1.88)	(.12)	(.11)	(.13)	(.11)		(.14)	(.12)	(.14)	(.10)		(.15)	(.14)	(.15)	(.11)	
Shape Concern[c]	1.67	1.81	1.69	1.97	-	1.68	1.81	1.72	1.78	-	1.67	1.85	1.76	1.91	-
(2.07)	(.12)	(.11)	(.12)	(.07)		(.14)	(.12)	(.14)	(.10)		(.17)	(.15)	(.17)	(.12)	
Dieting[c]	1.93	2.12	1.92	2.10	-	1.98	2.04	1.90	1.91	-	1.91	1.97	1.85	1.96	-
(2.22)	(.08)	(.07)	(.08)	(.05)		(.08)	(.07)	(.09)	(.06)		(.10)	(.08)	(.09)	(.07)	
Body Dissatisfaction[b,c]	2.53	2.45	2.58	2.82	MS<C(.26)	2.49	2.60	2.62	2.67	-	2.62	2.70	2.87	2.62	-
(2.78)	(.12)	(.11)	(.12)	(.10)	LS<C(.33)	(.12)	(.12)	(.12)	(.10)		(.13)	(.12)	(.13)	(.11)	
Media Internalization[a,b,c]	1.95	2.31	2.08	2.49	MS<LS (.44)	1.97	2.39	2.07	2.49	MS<LS(.44)	2.03	2.33	2.15	2.45	MS<C(.46)
(2.43)	(.09)	(.05)	(.09)	(.05)	MS<C(.68)	(.09)	(.06)	(.09)	(.07)	MS<C(.61)	(.10)[a]	(.09)	(.10)	(.07)[b]	
					HP<C(.47)					HP<C(.50)					
Perceived Pressure[c]	1.45	1.72	1.71	1.70	-	1.59	1.59	1.44	1.65	-	1.72	1.63	1.57	1.77	-
(1.53)	(.09)	(.05)	(.10)	(.07)		(.09)	(008)	(.09)	(.06)		(.11)	(.10)	(.11)	(.08)	
Depression[a,c]	.24	.37	.28	.31	-	.20	.37	.21	.29	MS<LS (.51)	.22	.37	.30	.39	MS<C (.39)
0.31	(.04)	(.03)	(.04)	(.03)		(.04)	(.03)	(.04)	(.03)	HP<LS (.46)	(.05)	(.04)	(.05)	(.03)	
Weight-related peer	1.47	1.69	1.76	1.61	MS<HP (.57)	1.43	1.65	1.63	1.65	-	1.47	1.73	1.62	1.67	-
Teasing[a,c]	(.07)	(.06)	(.07)	(.05)		(.08)	(.07)	(.08)	(.06)		(.09)	(.08)	(.09)	(.06)	

(1.63)															
Perfectionism[c]	1.82	2.03	2.03	2.11	MS<C(.40)	1.91	2.15	2.15	2.14	-	1.92	2.04	2.01	2.12	-
(2.10)	(.08)	(.05)	(.08)	(.06)		(.08)	(.07)	(.08)	(.06)		(.09)	(.08)	(.09)	(.06)	
Regular eating[c]	4.53	4.37	4.48	4.58	-	4.53	4.48	4.58	4.62	-	4.53	4.43	4.49	4.47	-
(4.49)	(.08)	(.07)	(.08)	(.06)		(.07)	(.06)	(.07)	(.05)		(.08)	(.07)	(.08)	(.06)	
Screen Time[a]	1.57	1.64	1.63	1.66	-	1.67	1.70	1.67	1.74	-	1.54	1.70	1.74	1.73	MS<LS (.43)
(1.54)	(.04)	(.04)	(.04)	(.03)		(.04)	(.04)	(.04)	(.05)		(.05)	(.04)	(.05)	(.03)	MS< HP (.55)
Physical Activity[b]	1.57	1.64	1.52	1.55	-	1.61	1.57	1.48	1.56	-	1.53	1.49	1.43	1.59	C>HP (.46)
(1.48)	(.04)	(.04)	(.04)	(.03)		(.04)	(.04)	(.04)	(.03)		(.04)	(.04)	(.04)	(.03)	
BMI	20.05	20.03	20.06	20.09	-	20.46	20.33	20.14	20.28	-	20.69	20.66	20.80	20.82	-
(20.01)	(.12)	(.11)	(.12)	(.07)		(.13)	(.12)	(.13)	(.09)		(.19)	(.17)	(.18)	(.13)	

*Note.*The effect of the baseline value has been statistically removed to allow for direct comparisons across program attendance, gender and time. Significant effects are indicated by: [a] = group, [b] = group X time, [c] = group X time X gender. MS = *Media Smart*; LS = *Life Smart*; *HELPP* = Helping Encouraging Listening and Protecting Peers; C = Control; M = adjusted estimated marginal mean; SE = standard error; ES = Effect sizes (Cohen's *d)* for Bonferroni-adjusted post-hoc testing of significant between-groups' difference by gender at post-program, 6-month- and 30-month follow-up: * $p<.05$, ** $p<.01$. Although girls and boys presented in separate tables, the analyses were conducted simultaneously.

Table 4

Number (N) and percentage (%) of new cases who had clinical levels of weight concern or who became overweight by 12-month follow-up

	Girls				Boys			
	MS	LS	HP	Cont	MS	LS	HP	Cont
	N (%)	*N* (%)	*N* (%)	*N* (%)	*N* (%)	*N* (%)	*N* (%)	*N* (%)
Clinical levels of Shape & Weight Concern	9 (8)	28 (18)	8 (12)	37 (19)	1 (2)	2 (2)	1 (1)	3 (2)
BMI percentile > 85	5 (4)	11 (7)	6 (7)	12 (7)	3 (5)	2 (3)	4 (5)	4 (3)

Note MS = Media Smart; LS = Life Smart; HP = HELPP; Cont= control; *N* = number of new cases; % = percentage of participants within that group who developed clinically significant levels of shape concern/weight concern or BMI percentile greater than 85.