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DEPRESSION AS A MODERATOR OF BENEFIT FROM MEDIA SMART:
A SCHOOL-BASED EATING DISORDER PREVENTION PROGRAM

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Running Head: DEPRESSION AS A MODERATOR

KEYWORDS: eating disorders; prevention, depression, moderator, risk factors.

Highlights

- To date there have been no examinations of moderators of outcome in universal eating disorder prevention trials
- This study investigated if depression moderated outcome of *Media Smart*, a school-based program previously found to reduce risk factors over a 2.5-year follow-up
- Baseline depression moderated program outcome for shape and weight concern, media internalization, body dissatisfaction, ineffectiveness and perceived pressure.
- Participants with high depression experienced significant immediate benefit from *Media Smart* at post-program, while those with low depression experienced a prevention effect over the 2.5-year follow-up.
- The goal of universal eating disorder prevention programs should be to halt risk factor growth over time and *Media Smart* did this for the important variable of shape and weight concern.

Abstract

Objective: To investigate if baseline depression moderated response to *Media Smart*, an 8-lesson school-based program previously found to achieve a long-term risk reduction effect in young adolescents. **Method:** 540 Grade 8 students (M age = 13.62 years, $SD = .37$) from 4 schools participated with 11 classes receiving the *Media Smart* program (126 girls; 107 boys) and 13 comparison classes receiving their normal lessons (147 girls; 160 boys). Shape and weight concern, media internalization, body dissatisfaction, dieting, ineffectiveness, and perceived pressure were the outcome variables. **Results:** Moderation was indicated by significant interaction effects for group (*Media Smart*; Control) X moderator (high depression; low depression) X time (post-program; 6-month follow-up; 2.5-year follow-up), with baseline entered as a covariate. Such effects were found for shape and weight concern, media internalization, body dissatisfaction, ineffectiveness and perceived pressure. Post-hoc testing found high depression *Media Smart* participants scored significantly lower than their control counterparts at post-program on shape and weight concern, media internalization and dieting, whereas low depression *Media Smart* participants scored significantly lower on shape and weight concern at 2.5-year follow-up. **Discussion:** *Media Smart* achieved a reduction in eating disorder risk factors for high-depression participants and a reduced rate of growth in risk factor scores for low-depression participants.

Trial registry name: Australian New Zealand Clinical Trials Registry

URL: <http://www.anzctr.org.au>

Registration identification number: ACTRN12608000545369

Introduction

Although some eating disorder prevention programs show promise in reducing risk (Stice, Marti, Spoor, Presnell, & Shaw, 2008a; Taylor, et al., 2006; Wilksch & Wade, 2009a), maximising the beneficial impact of such programs remains an important endeavour. Eating disorders are characterized by high mortality (Harris & Barraclough, 1998), a destructive physical and psychological course, low rates of presentation to treatment (Johnson, Cohen, Kasen, & Brook, 2002) and comparatively poor treatment outcomes (Steinhausen, 2002). It has been suggested that one way to refine interventions is by investigating potential moderators of intervention effects (Kraemer & Gibbons, 2009). A moderator variable provides information about for whom and under what conditions an intervention is beneficial (Kraemer, Wilson, Fairburn, & Agras, 2002).

Broadly speaking, the eating disorder prevention field has made progress in the past decade in identifying program features that are likely to achieve larger effect sizes. Meta-analyses have revealed better results for programs that: are of multiple session duration rather than a single session (i.e., sufficient intensity); interactive rather than didactic; delivered by professional interventionists rather than endogenous presenters (e.g., teachers); evaluated with validated measures; and avoid education about eating disorders and their effects (Stice & Shaw, 2004; Stice, Shaw, & Marti, 2007). However, we know far less about how and which individual participant variables moderate program outcomes. To date, only three individual variables have been investigated using meta-analyses, where Stice and colleagues coded each study according to: gender (females only vs mixed gender); age (mean age 15 years and above vs less than 15 years); and, participant risk status (selective vs universal). Selective refers to populations who are considered to be at high risk of developing an eating disorder (e.g., females and/or those with self-identified weight concerns). Universal refer to including all participants, regardless of risk status (e.g., school classroom of girls and boys). Larger effect sizes were found for studies where participants were: females; above the age of 15; and in selective programs. These between-study comparisons are important and have fuelled an increase in selective prevention programs with late-adolescent, young adult females deemed to be at high-risk of an eating disorder.

However, further work needs to be conducted to understand individual participant variables that can moderate outcome, where a greater focus needs to be given to theoretically-informed moderators (Kraemer, et al., 2002). Although the selective prevention field has made some important steps in this area (Müller & Stice, 2013; Stice, Marti, Shaw, & O'Neil, 2008b; Stice, Rohde, Gau, & Shaw, 2012; Taylor, et al., 2006), research focus needs to also be directed to moderators of universal interventions in order to understand what might influence the outcome of long-term universal prevention trials. It has been suggested that ideally, eating

disorder prevention should operate across a spectrum where pre- and early-adolescents receive empirically-informed universal programs where those requiring additional input might later benefit from participation in selective and targeted programs (Neumark-Sztainer, et al., 2006; Wilksch & Wade, 2009b). Thus it is important that the universal approach not be overlooked in our collective efforts to prevent eating disorders and to the best of our knowledge, the current study is the first to investigate individual participant variables that might moderate program outcome of a universal eating disorder prevention program.

Media Smart has previously been evaluated in a controlled efficacy trial with $N=540$ Grade 8 girls and boys, with assessment of eating disorder risk factors at baseline, post-program (1-month later), 6-month follow-up and 2.5-year-follow-up (Wilksch, 2010; Wilksch & Wade, 2009a). Four schools participated in the research and in each school, half of the classes were randomly allocated to either *Media Smart* or a no-intervention control condition (i.e., usual school classes) to ensure that idiosyncrasies peculiar to each school were evenly represented across conditions. Linear mixed model analyses were conducted with baseline entered as a covariate, with significant main effects for condition favouring *Media Smart* for the core cognitive feature of eating disorders, over-evaluation of shape and weight (Cohen's d effect size [ES]=.35), as well as on other important risk factors: shape and weight concern (ES=.29); dieting (ES=.26); body dissatisfaction (ES=.20); ineffectiveness (ES=.23); and depression (ES=.26). Post-hoc testing revealed girls in the *Media Smart* condition continued to have significantly lower shape and weight concern scores at 2.5-year follow-up than their controlled counterparts. Shape and weight concern is considered the most robust and proximal eating disorder risk factor (McKnight Investigators, 2003). It has been found to increase from early adolescence and to be associated with disordered eating attitudes and behaviours by mid-adolescence (Cooper & Goodyer, 1997). In contrast to the conclusions from the meta-analyses of Stice and colleagues (2004; 2007) we found *Media Smart* was of significant benefit to both females and males, participants who were at both high- and low-baseline risk of an eating disorder (i.e., universal audience) and who were below the age of 15.

In the current study, depression was examined as a potential moderator of the impact of *Media Smart*, a universal 8-lesson school-based media literacy program for young-adolescent girls and boys. The importance of selecting theoretically-informed potential moderators has been outlined (Kraemer, et al., 2002) and in the area of disordered eating, negative affect has been identified in the dual pathway model of bulimic pathology as a risk and maintenance factor for such eating (Stice, 2002). There are also six empirical reasons for hypothesizing that depression could be an important moderator of *Media Smart* impact. First, in an examination of participant-specific program moderators in the selective eating disorder prevention field, negative affect was found to

moderate outcome of three interventions amongst female adolescents (M age = 17.1 years) at high-risk of an eating disorder (Stice, et al., 2012). Specifically, elevated baseline negative affect increased the incidence of eating disorder onset over the 3-year follow-up from 5.2% to 20% for cognitive-dissonance participants, 5.4% to 12.5% for healthy weight participants, and from 5.3% to 27.3% for expressive writing participants. Second, depression is one of the most prevalent mental health problems experienced by adolescents with 49% of females and 34% of males reporting weekly depressive symptoms over a 6-month period (Scheidt, Overpeck, Wyatt, & Aszmann, 2000). This is particularly relevant to universal, school-based prevention programs where it is important that program content and targets are applicable to as many participants as possible. Third, depression has been identified as impeding recovery in treatment of bulimia nervosa with both adolescents (Le Grange, Crosby, & Lock, 2008) and adults (Steel, et al., 2000). Fourth, prevention programs in other fields such as substance abuse have been found to be less beneficial in participants with higher levels of depression (Amaro, Blake, Schwartz, & Flinchbaugh, 2001). Fifth, eating disorder prevention messages are rated as less persuasive by adolescent girls with higher depression scores (Paxton, Wertheim, Pilawski, Durkin, & Holt, 2002). Finally, depression is a modifiable condition where a number of evidence-base treatments have emerged (e.g., cognitive-behavioural therapy, behavioural activation, interpersonal psychotherapy). If it is found to impede prevention program response a number of evidence-based strategies are available to improve program outcomes.

Thus the current research is the first formal investigation of depression as a potential moderator of a universal eating disorder prevention program, and the first investigation of a moderator for such programs with girls as well as boys. In line with findings from other areas of prevention, we hypothesised that elevated depression at baseline would reduce the benefit of *Media Smart* across the measured eating disorder risk factors. Our secondary analyses related to investigating two additional potential moderators of program outcome, namely, media internalization and body dissatisfaction. Media internalization was included because it is a key risk factor target of *Media Smart*, where both internalization and body dissatisfaction were included as they appear in the dual-pathway model of bulimic pathology (Stice, 2002) and have been investigated as a moderator in selective eating disorder prevention trials (Müller & Stice, 2013; Stice, et al., 2008b). These earlier trials found a moderating effect of internalization where participants with elevated baseline internalization in the cognitive dissonance condition reported significantly lower bulimic symptoms at post-program and 6-month follow-up than control participants with elevated baseline internalization (Stice, et al., 2008b). A similar pattern was found across groups for those with elevated baseline levels of body dissatisfaction at post-program but where follow-up was not included (Müller & Stice, 2013).

Method

Participants and Program

The characteristics of the participants and *Media Smart* program have been previously described in the report of our 2.5-year controlled trial (Wilksch & Wade, 2009a). Briefly, twenty-four classes of 540 Grade 8 students (M age = 13.62 years, SD = .37) from one public school, one Catholic school and two private schools, were randomly allocated to either *Media Smart* (126 girls; 107 boys) or control (normal school lessons; 147 girls; 160 boys). In each school, half of the classes were randomly allocated to each condition to ensure that idiosyncrasies peculiar to each school were evenly represented across conditions. Intact classes participated and thus no exclusion criteria were used, all classes were from Adelaide, South Australia, with recruitment, interventions and outcome assessments between May, 2005 and August, 2008.

Approval for this research was received from the Flinders University Social and Behavioural Research Ethics Committee, the South Australian Department of Education and Children's Services, the Director of Catholic Education, and school principals of independent private schools. The 8-lesson (50-minute) *Media Smart* program was delivered at the rate of two lessons per week by SMW with the regular class teacher also present.

Measures

Seven eating disorder risk factors were measured using validated self-report questionnaires that are common to the eating disorder field (Durkin, Paxton, & Wertheim, 2005; Wilksch, Durbridge, & Wade, 2008; Wilksch, Starkey, Gannoni, Kelly, & Wade, in press; Wilksch, Tiggemann, & Wade, 2006; Wilksch & Wade, 2009a). Previous studies have reported sound psychometric properties for these measures in use with adolescent populations (Banasiak, Wertheim, Koerner, & Voudouris, 2001; Nishizono-Maher, Miyake, & Nakane, 2004; Wilksch & Wade, 2012). These measures are summarized in **Table 1**, including the number of items, internal reliability from the current study (Cronbach's alpha), scoring range and example item. Participants completed questionnaires on four occasions: pre-program; post-program (1-month later); 6-month follow-up; and, 2.5-year follow-up.

Regarding the measures of moderator variables, the Children's Depression Inventory – Short Form (CDI-S) measures a range of depressive symptoms, including disturbed mood, vegetative functions, and interpersonal behaviours, and has been found to correlate highly ($r = .89$) with the complete measure (Kovacs, 1992). The CDI is the most commonly used measure of depressive symptomatology in depression studies with children and adolescents (Horowitz & Garber, 2006) and has been reliably used with early adolescent Australian

samples (Roberts, Kane, Thomson, Bishop, & Hart, 2003). The validity and reliability of the Sociocultural Attitudes Towards Appearance Questionnaire-3 (Thompson, van den Berg, Roehrig, Guarda, & Heinberg, 2004) as a measure of media internalization has been previously confirmed with young-adolescent Australian girls and boys (Wilksch & Wade, 2012). Finally, the Eating Disorder Inventory – Body Dissatisfaction scale (Garner, Olmstead, & Polivy, 1983) is widely used in eating disorder research and has been found to be reliable and valid measure for 11-18-year-old participants (Shore & Porter, 1990).

Put Table 1 About Here

Statistical Analyses

Baseline Data

Mean item baseline differences between the groups were investigated using t-tests with an alpha level of .05. Effect sizes for between-group differences at baseline were calculated using the point biserial correlation coefficient (r_{pb}) where $r_{pb} = \sqrt{t^2/(t^2+df)}$, where .1 = low, .3 = moderate and .5 = substantial (Matthey, 1998).

Investigation of Depression as a Moderator

Moderation analyses were conducted using linear mixed models. The superiority of these analyses over ANOVA techniques has been previously discussed (Nich & Carroll, 1997) and includes the use of all available data, better accounts for correlations from repeated measurements from the same participant, greater flexibility to model time effects and provides unbiased estimates in the presence of missing data without relying on imputation. All models were run using baseline scores as a covariate to ensure that any effects were due to changes at post-program and follow-up, rather than due to variation in scores at baseline or measurement error.

The need to dichotomize potential moderators has been outlined (Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001) and thus we used a median-split to define high- and low-baseline levels of the moderators: depression; media internalization; and, body dissatisfaction. We aimed to achieve a split of baseline depression of approximately 40% (high depression): 60% (low depression), which is consistent with prevalence estimates of depressive symptoms in early adolescents (Kovacs, 1992). The actual breakdowns were, girls: 58% low depression ($N=141$; $M=0.14$, $SD=0.11$) and 42 % high depression ($N=102$; $M=0.74$, $SD=0.32$), and for boys: 60.4% low depression ($N=139$; $M=0.08$, $SD=0.08$) and 39.6 % high depression ($N=91$; $M=0.58$, $SD=0.31$).¹

We then ran an interaction model of sex (girls; boys) X moderator (high; low) X group (*Media Smart*; control) to test whether moderation analyses needed to be conducted separately by girls and boys. No

¹ Analyses with a 50:50 median split of baseline depression revealed the same pattern of moderation findings with significant post-hoc effects as those reported in this paper using a 60:40 split.

significant interactions emerged and therefore boys and girls were combined in the analyses. Thus the analyses reported in this paper were conducted using a model of group (*Media Smart*; control) X moderator (high; low) X time (post-program; 6-month follow-up; 2.5-year follow-up), where baseline levels of the dependent variable were entered as a covariate. Significant interactions with this model indicated that moderation was occurring. The alpha level for testing interactions was 0.05. A priori Bonferroni-adjusted pairwise comparisons were conducted, where Cohen's d was calculated for significant interactions and between-groups post-hoc comparisons ($d = [2 \sqrt{F}] / \sqrt{df(error)}$), where .2 = small, .5 = moderate, .8 = large (Matthey, 1998). Random effects for school class across schools were also included in the model to account for the nested nature of the data and to test whether covariation differed across classes.

This process was then repeated for the supplementary moderators, media internalization and body dissatisfaction. The breakdowns for media internalization were, girls: 51.6% low internalization ($N=126$; $M=1.83$, $SD=0.49$) and 48.4 % high internalization ($N=118$; $M=1.63$, $SD=0.49$), and for boys: 51.1% low internalization ($N=120$; $M=1.46$, $SD=0.50$) and 48.9 % high internalization ($N=115$; $M=1.51$, $SD=0.50$). Finally, the breakdowns for body dissatisfaction were, girls: 54.4% low body dissatisfaction ($N=131$; $M=1.30$, $SD=0.46$) and 45.6 % high body dissatisfaction ($N=110$; $M=1.68$, $SD=0.47$), and for boys: 50.2% low body dissatisfaction ($N=116$; $M=1.35$, $SD=0.47$) and 49.8 % high body dissatisfaction ($N=115$; $M=1.70$, $SD=0.46$). For each set of moderation analyses, all outcome variables were analysed with the exception of using the same variable as both a moderator and outcome (i.e., the effect of depression as a moderator on depression as an outcome variable was not investigated).

Results

Baseline Measures

Table 2 presents mean item baseline scores for *Media Smart* and control participants. No significant differences emerged on the three investigated moderators (depression, media internalization and body dissatisfaction). *Media Smart* participants did have significantly higher baseline shape and weight concern and dieting scores, although this was of low ES. This supported the statistical approach of using baseline as a covariate in our moderator analyses to ensure any significant findings were not due to baseline differences.

Put Table 2 About Here

Primary Investigation: Depression as a Moderator

Interaction effects (group X moderator X time) were found to be significant for shape and weight concern [$F(8, 292.11)=3.55$, $p=.001$, $d=.22$], media internalization [$F(8, 310.24)=4.42$, $p<.001$, $d=.24$], body

dissatisfaction [$F(8, 310.91)=2.27, p=.022, d=.17$], ineffectiveness [$F(8, 302.91)=2.55, p=.011, d=.18$], and perceived pressure [$F(8, 296.60)=2.32, p=.02, d=.18$]. **Table 3** provides mean item scores by group, moderator and time, where it can be seen that each of the interactions favoured the *Media Smart* group. It can be seen that for shape and weight concern, *Media Smart* participants with high depression scored significantly lower than their control counterparts at post-program and low depression *Media Smart* participants scored significantly lower than their control counterparts at 2.5-year follow-up. For media internalization, high depression *Media Smart* participants scored significantly lower than their control counterparts at post-program. For ineffectiveness, low depression *Media Smart* participants scored significantly lower than their control counterparts at post-program. Although significant interactions were found for body dissatisfaction and perceived pressure, post-hoc testing revealed no significant differences in pairwise comparisons. Finally, although the interaction for dieting was not significant, post-hoc testing showed *Media Smart* participants with high depression scored significantly lower than control participants at post-program and 6-month follow-up.

Figure 1 provides a graphical illustration of the findings for shape and weight concern. Depression levels moderated the relationship between group and time at post-program for high-depression participants [$F(1, 75.46)=9.59, p=.003, d=.71$] and at 2.5-year follow-up for low-depression participants [$F(1, 135.39)=6.40, p=.013, d=.43$]. At both time points, *Media Smart* participants scored lower than their control counterparts. Of particular interest, was the finding that participants from both the *Media Smart* and control conditions with high baseline depression had lower scores than their low-depression peers at 2.5-year follow-up. To further explore this, an ANCOVA was run for shape and weight concern at 2.5-year follow-up (with baseline entered as a covariate). This allowed comparisons across moderator levels and group and revealed that high depression *Media Smart* participants had significantly lower levels of shape and weight concern at 2.5-year follow-up than low depression control participants, [$F(3, 248)=3.59, p=.014, d=.24$].

Figure 2 provides a graphical illustration of the findings for media internalization where depression moderated the relationship between group and time at post-program for high-depression participants where *Media Smart* participants scored lower than their low depression counterparts [$F(1, 59.79)=6.93, p=.011, d=.68$]. However, by 2.5-year follow-up, high-depression *Media Smart* and control participants scored lower than their low-depression counterparts. **Figure 3** provides the results for ineffectiveness where depression moderated the relationship between group and time at post-program for low-depression participants where *Media Smart* participants scored significantly lower than control participants [$F(1, 32.83)=6.42, p=.016, d=.88$].

Similar to media internalization however, by 2.5-year follow-up low-depression participants in both groups scored higher than their high-depression peers.

Put Table 3 and Figure 1 About Here

Supplementary investigation: Media Internalization and Body Dissatisfaction as Moderators

The above moderation testing procedure was applied to investigate if baseline levels of either media internalization or body dissatisfaction moderated the relationship between time and group on each of the outcome variables. No significant interactions were found for either set of analyses.

Discussion

This study investigated how baseline depression might moderate the impact of *Media Smart*, a universal program previously found to significantly reduce eating disorder risk factors in a 2.5-year controlled trial. Previous evidence suggests that elevated baseline depression impedes: prevention programs targeting late-adolescent females at high-risk of an eating disorder (Stice, et al., 2012); prevention programs targeting other problems such as substance abuse (Amaro, et al., 2001); the effectiveness of treatment for eating disorders (Le Grange, et al., 2008; Steel, et al., 2000); and, the persuasiveness of eating disorder prevention messages in young adolescent females (Paxton, et al., 2002). In addition, beyond participant gender, age and risk status, this is the first study to investigate how individual variables might impact response to a universal eating disorder prevention program.

Relating to our preliminary analyses, it was of interest that no significant interaction effects were found for the sex X group X moderator analyses. This suggests that girls with high and low levels of depression did not respond in a differing manner to *Media Smart* to boys with commensurate levels of depression who participated in the program. It is also consistent with the original RCT where both girls and boys experienced benefit from the program (Wilksch & Wade, 2009). In our primary analyses, level of depression was found to moderate the relationship between group and time on five of the six outcome variables measured, confirming that this variable has an important impact on the outcomes of psychological interventions. Generally speaking, the pattern was for *Media Smart* participants with high baseline depression to score significantly lower than control participants with high depression at post-program. Interestingly, at 6-month follow-up this pattern only continued for dieting whereas at 2.5-year follow-up there were no significant differences between high-depression participants in the *Media Smart* and control conditions. It is encouraging that students who perhaps most needed a prevention program did benefit the most from that program in the short-term and this is consistent with meta-analytic findings comparing selective and universal audiences (Stice & Shaw, 2004; Stice,

et al., 2007), where outcomes were more favourable for those with higher levels of pre-program eating disorder risk. Indeed, our results suggest that elevated depression at baseline was not a barrier to improvement from pre to post-program. A particularly striking result was that for shape and weight concern, *Media Smart* participants with high baseline depression completed the study 2.5-years later with significantly lower levels of shape and weight concern than low depression control participants. However, the lack of growth in risk factor scores over time for high depression control participants suggests that levels of eating disorder risk might not be stable over the early adolescent years and that high levels of depression in Grade 8 does not ensure risk levels will continue to stay high over the subsequent 2.5-years.

Conversely, low depression *Media Smart* participants scored significantly lower than their control counterparts at 2.5-year follow-up on both shape and weight concern and depression, but only one significant difference emerged at post-program, that of ineffectiveness. It was of interest that at 2.5-year follow-up, those with low-baseline depression had higher scores than those with high-baseline depression scores for all outcome variables except body dissatisfaction. This pattern is consistent with the above suggestion that eating disorder risk status might not be as stable over the early to mid-adolescent age range, compared to later age groups. Importantly, it suggests that those with low-depression at baseline should not be viewed as not requiring a prevention program, given the growth in scores in this study. This also indicates that the significant differences at 2.5-years between low depression *Media Smart* participants and low depression control participants on shape and weight concern, plus the positive trends for body dissatisfaction and ineffectiveness, should be viewed as important outcomes, especially given that the 2.5-year follow-up is the equal longest trial of a universal eating disorder prevention program with young-adolescents (González, Penelo, Gutiérrez, & Raich, 2011).

The pattern of moderation results found highlights the important differences in interpreting outcomes of universal prevention trials with young-adolescent girls and boys, compared to selective eating disorder prevention trials with young-adult women at high-risk of an eating disorder. Whilst clearly in the latter group, the goal is to *reduce* the level of eating disorder risk and maintain this improvement over follow-up, the overarching goal of universal prevention trials is to *prevent growth* in the level of eating disorder risk over the duration of study follow-up period, relative to the control group. Through this lens, the outcomes of the current trial were encouraging for *Media Smart* participants of both high- and low- levels of baseline depression.

Importantly, a main effect for group for depression was found in the original controlled trial where *Media Smart* participants had significantly lower scores than control participants across the post-program and follow-up assessments (Wilksch & Wade, 2009a). Shape and weight concern and eating disorder risk typically

increases through adolescence (Cooper & Goodyer, 1997), so it was encouraging to see that *Media Smart* participants with both high and low baseline depression reached study endpoint with lower shape and weight concern scores than at baseline. This is an important finding as it suggests that high-risk students can benefit without being separated from their low-risk peers. Rather they can experience significant improvements in a universal setting, avoiding problems of: stigmatization (Franko, 2001); impracticalities of having some students miss regular lesson time (Wilksch & Wade, 2009b); and, the difficulties associated with accurate identification of all high-risk students given how prevalent disturbed eating attitudes and behaviours are in adolescent populations. More broadly, these findings reinforce our previous conclusions of the program having a long-term benefit (Wilksch & Wade, 2009a) and are more promising than other studies where benefits have not been maintained over much shorter follow-up periods (Weiss & Wertheim, 2005) or where very limited benefits have been found (Stewart, Carter, Drinkwater, Hainsworth, & Fairburn, 2001).

In the context of other work that has explored the impact of baseline depression on response to interventions, our findings are positive. In contrast to a study where depression has been found to reduce the effectiveness of substance abuse prevention programs (Amaro, et al., 2001), our findings showed that those with higher depression experienced greatest benefit in the short-term. Our findings were also different to those of a pilot study where girls with higher baseline depression experienced less benefit in reductions in media internalization scores than girls with lower depression (Wilksch, et al., 2006). However it is likely that the complete 8-lesson program used in the current study was of sufficient duration to achieve reductions in risk, unlike the single lesson intervention from our pilot study. Paxton and colleagues (2002) found higher depression, along with higher levels of body dissatisfaction and dieting, was associated with reduced persuasiveness of brief prevention messages with Grade 7 and Grade 8 Australian girls. Although persuasiveness of message was not measured in our study, over 98% of participants rated *Media Smart* as valuable, regardless of baseline risk scores (Wilksch & Wade, 2009a).

It was of interest that both body dissatisfaction and media internalization did not emerge as significant moderators of program outcome. Both variables have been found to be moderators in selective prevention programs with female-only, older high-risk audiences (Müller & Stice, 2013; Stice, et al., 2008b). This differing pattern in results for depression versus body dissatisfaction and media internalization is consistent with recent research suggesting that depression, together with shape and weight concern, are two of the most important eating disorder risk factors in adolescent samples (Jacobi & Fittig, 2010). Further, given how highly prevalent body dissatisfaction is amongst adolescents, it could be that depression is a better variable for

differentiating eating disorder risk status in these samples. As such, it might be useful to augment *Media Smart* with some additional learning activities that further targets depression, in order to heighten the benefits. Some empirically-based intervention activities could include increasing participation in enjoyable activities (Stice, Rohde, Seeley, & Gau, 2008c), or from the positive psychology field, having students record daily three events that went well and what caused them to go well. These types of activities are likely to be particularly useful since adding a homework component is associated with larger effect sizes in reducing depressive symptoms (Stice, Shaw, Bohon, Marti, & Rohde, 2009).

Four limitations impact on the interpretations of these findings. First, data was missing from 45% of participants at 2.5-year follow-up. Although, linear mixed models are robust and can handle absent data without excluding cases and multiple imputation is not indicated when data is missing completely at random or missing at random (EMGO+ Institute of Care and Health Research, 2012), it is not ideal to have lower power at the 2.5-year follow-up where ideally conclusions about the long-term effects of the program would be drawn. Missing data is an inevitable feature of school based research, particularly in longitudinal designs that extend across school years where as reported in our original trial, almost half of those participants lost to 2.5-year follow-up had changed schools (Wilksch & Wade, 2009a). Second, it has been previously suggested that there is less construct stability in some eating disorder risk factors over time in young-adolescents compared to older-adolescent and young-adult samples (McKnight Investigators, 2003; Wilksch & Wade, 2012). As such, some caution is required in interpreting the current findings until a replication trial is available. Third, we have no record of how many intervention lessons were attended by each participant so it was not possible to ascertain if there was a dose-response relationship between number of lessons attended and reduction in eating disorder risk achieved. Fourth, the lack of measurement of disordered eating behaviours is a limitation. This was not measured due to concern expressed by a school Principal that such questions may inadvertently provide potentially harmful information about disordered eating to vulnerable students who were not previously familiar with these behaviours. Although we did provide research evidence that these measures were of minimal risk to young people (Celio, Bryson, Killen, & Taylor, 2003), we also believe that it would be counter-intuitive to have students complete measures at baseline and follow-up that specify various eating disorder behaviours (e.g., vomiting, laxative use) when the content of the prevention program deliberately avoids providing information about such behaviours (Stice, et al., 2007). Thus although measuring program impact on prospectively identified eating disorder risk factors is an appropriate way to evaluate program efficacy with a young-adolescent, universal sample, the absence of measurement of clinical behaviours is a limitation in this study.

Taken collectively, the results of this study suggest that depression was a moderator of program outcome on most risk factors measured. An interesting mix of findings emerged where *Media Smart* had an immediate post-program benefit for those with high baseline levels of depression, however it seemed control participants with high baseline depression did not go on to have a commensurate growth in eating disorder risk factors over time. Meanwhile, *Media Smart* was able to halt the growth of eating disorder risk factors in those with low baseline depression, where this difference was significant for shape and weight concern at 2.5-year follow-up, and where non-significant favourable trends emerged for body dissatisfaction, ineffectiveness and media internalization. The current study adds further support to the value of efficacious universal eating disorder prevention programs where it is possible for high-risk students to receive important immediate benefits, whereas low-risk students experienced valuable benefits over the course of a long-term follow-up.

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Table 1

Summary and description of self-report measures

Variable	Description and Cronbach's alpha
Depression	Child Depression Inventory –Short Form, (Kovacs, 1992)10 items (Girls $\alpha = .86$; Boys $\alpha = .83$). e.g., 0 = “ <i>I am sad once in a while</i> ” to 2 = “ <i>I am sad all the time</i> ”.
Media internalization*	Sociocultural Attitudes Towards Appearance Questionnaire-3,(Thompson, et al., 2004) 30-items (Girls $\alpha = .96$; Boys $\alpha = .97$) e.g., <i>I compare my body to the bodies of TV and movie stars</i> , 1= “definitely disagree” to 5 = “definitely agree”
Body dissatisfaction*	Eating Disorder Inventory (EDI): Body Dissatisfaction, 9 items (Girls (Garner, et al., 1983) $\alpha = .90$). e.g., <i>I think that my stomach is too big</i> , 6= “Always” to 1 = “Never” (Boys (Hallsworth, Wade, & Tiggemann, 2005) $\alpha = .81$). e.g., <i>I think my biceps are too small</i> 6= “Always” to 1 = “Never”
Shape and weight concern	Eating Disorder Examination – Questionnaire,(Fairburn & Beglin, 1994) 12 items (Girls $\alpha = .95$; Boys $\alpha = .92$). e.g., <i>Has your weight influenced how you think about yourself as a person?</i> , 0 = “Not at All” to 6 = “Marked”
Dieting	Dutch Eating Behaviour Questionnaire – Restraint,(Van Strien, Frijters, Bergers, & Defares, 1986) 10 items (Girls $\alpha = .94$; Boys $\alpha = .93$). e.g., <i>Do you deliberately eat foods that are slimming?</i> , 1 = “Never” to 5 = “Very Often”
Ineffectiveness	EDI: Feelings of Ineffectiveness,(Garner et al., 1983) 10 items (Girls $\alpha = .90$; Boys $\alpha = .86$). e.g., <i>I feel inadequate</i> , 6= “Always” to 1 = “Never”
Perceived pressure*	Perceived Sociocultural Pressure Scale,(Stice, Ziemba, Margolis, & Flick, 1996) 6 items (Girls $\alpha = .85$; Boys $\alpha = .88$). e.g., <i>I've felt pressure from my friends to lose weight</i> , 1 = <i>Not at All</i> to 5 = <i>A Lot</i>

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

Table 2

Baseline means (and standard deviations) for risk factors by group (Media Smart and control)

		Media Smart	Control	Main Effect	ES
<u>Baseline Measures</u>	Range	M (SD)	M (SD)	<i>t</i> (df)	<i>r</i> _{pb}
Shape & Weight Concern	0-6	2.07 (1.58)	1.68 (1.54)	2.76* (476)	.13
Depression	0-2	0.33 (.34)	0.34 (.36)	-.51 (471)	.02
Media Internalization	1-5	2.47 (.86)	2.43 (.86)	0.40 (477)	.02
Body Dissatisfaction	1-6	3.15 (1.16)	2.99 (1.15)	1.54 (470)	.07
Dieting	1-5	2.08 (.97)	1.81 (.92)	3.12* (470)	.14
Ineffectiveness	1-6	2.48 (.97)	2.51 (.95)	-.28 (463)	.01
Perceived pressure	1-5	1.74 (.79)	1.72 (.90)	.23 (471)	.01

Notes M= Mean, SD = Standard Deviation, ES = Effect size, * $p < .01$,

Table 3

Mixed models estimated marginal means for eating disorder risk factors by time (3), moderator (2) and group (2).

Measures	Post-program						6-month follow-up						30-month follow-up					
	High Depression			Low Depression			High Depression			Low Depression			High Depression			Low Depression		
	MS	Control	ES	MS	Control	ES	MS	Control	ES	MS	Control	ES	MS	Control	ES	MS	Control	ES
	M	M	<i>d</i>	M	M	<i>d</i>	M	M	<i>d</i>	M	M	<i>d</i>	M	M	<i>d</i>	M	M	<i>d</i>
	(SE)	(SE)		(SE)	(SE)		(SE)	(SE)		(SE)	(SE)		(SE)	(SE)		(SE)	(SE)	
SWC*	1.47	1.95	.71*	1.61	1.71	.25	1.79	2.06	.24	1.78	1.87	.13	1.58	1.87	.15	1.84	2.38	.43*
	(.11)	(.11)		(.09)	(.10)		(.14)	(.13)		(.11)	(.12)		(.20)	(.18)		(.15)	(.15)	
BD*	2.85	2.94	.11	2.81	2.90	.18	2.97	3.07	.11	2.95	3.08	.23	3.09	2.89	.13	2.98	3.29	.30
	(.10)	(.10)		(.07)	(.09)		(.10)	(.10)		(.08)	(.09)		(.16)	(.14)		(.12)	(.12)	
Internalization*	2.17	2.45	.68*	2.16	2.18	.09	2.34	2.41	.10	2.39	2.42	.09	2.33	2.30	.03	2.44	2.54	.19
	(.08)	(.08)		(.06)	(.07)		(.09)	(.09)		(.07)	(.08)		(.12)	(.11)		(.09)	(.09)	
Dieting	1.74	2.14	.34*	1.76	1.86	.10	1.87	2.12	.20*	1.86	1.92	.06	1.94	2.17	.16	2.03	2.08	.05
	(.09)	(.09)		(.07)	(.07)		(.09)	(.08)		(.07)	(.07)		(.14)	(.12)		(.10)	(.12)	
Ineffectiveness*	2.49	2.68	.37	2.24	2.49	.88*	2.53	2.55	.05	2.31	2.39	.20	2.34	2.30	.04	2.47	2.64	.25
	(.09)	(.09)		(.07)	(.09)		(.10)	(.10)		(.08)	(.08)		(.14)	(.13)		(.10)	(.10)	
Perceived Pressure*	1.67	1.79	.08	1.71	1.64	.05	1.84	1.93	.06	1.73	1.80	.05	1.92	1.89	.02	1.91	1.98	.05
	(.09)	(.10)		(.07)	(.09)		(.10)	(.10)		(.08)	(.09)		(.15)	(.14)		(.11)	(.11)	

Notes. The effect of the baseline value of the dependent variable has been statistically removed to allow for direct comparisons across time (post-program; 6-month follow-up; 30-month follow-up), moderator (high baseline depression; low baseline depression) and group (Media Smart; Control). The covariate values were: Depression = .33; Body dissatisfaction (BD) = 3.07; Internalization (Media) = 2.41; Shape and weight Concern (SWC) = 1.88; Dieting = 1.93; Ineffectiveness = 2.47; Perceived Pressure = 1.72. Significant interaction effects shown by ^a = group* moderator*time. Cohen's *d* is for the post-hoc testing of the between groups' difference by time, moderator and group (using least significant difference comparisons). Numerical superscript indicates post-hoc testing (using least significant difference comparisons) of any significant between-group differences. MS = Media Smart; M = adjusted estimated marginal mean; SE = standard error; ES = effect size. Tests of significant pairwise comparisons between different groups of same depression level at same-assessment point: * $p < .05$

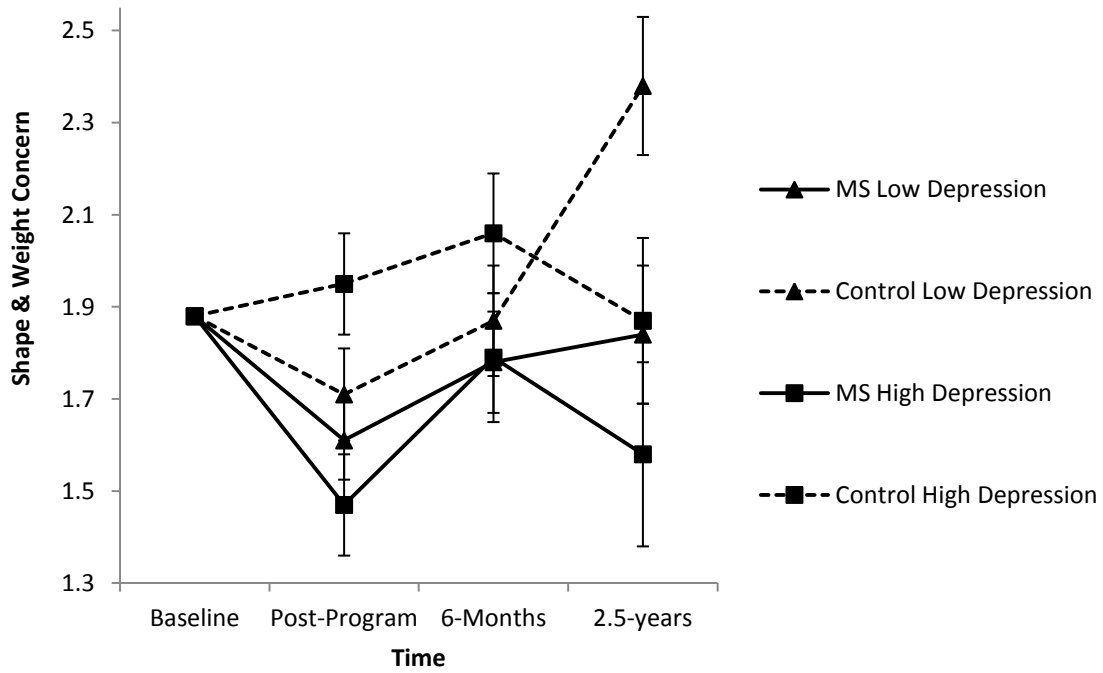


Figure 1. Shape and weight concern scores by group (2), baseline depression levels (2) and time (3).

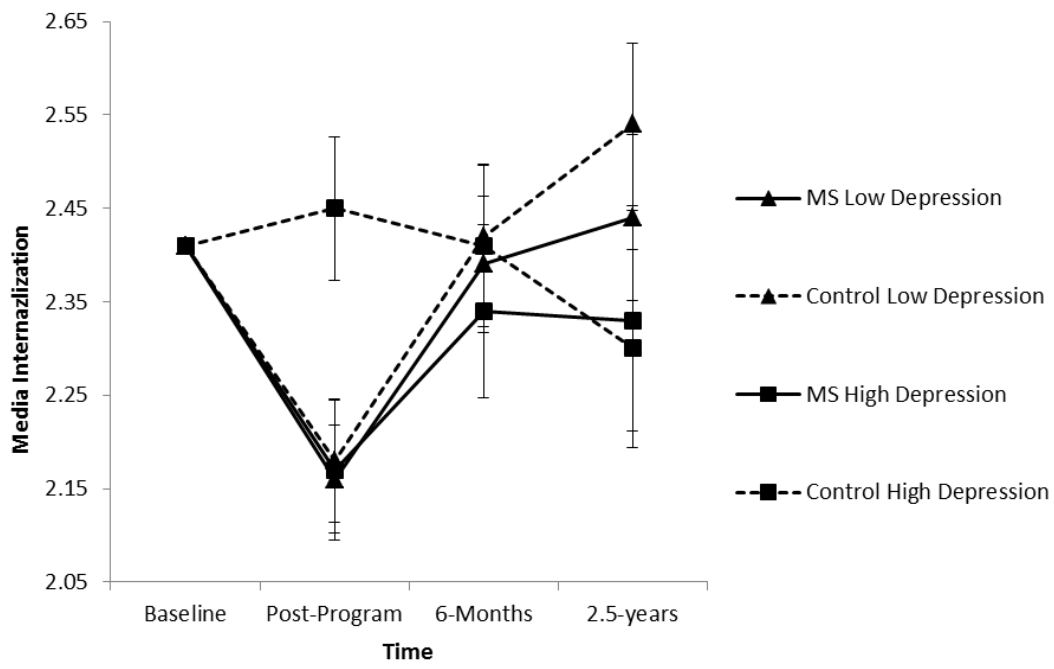


Figure 2. Media internalization scores by group (2), baseline depression levels (2) and time (3).

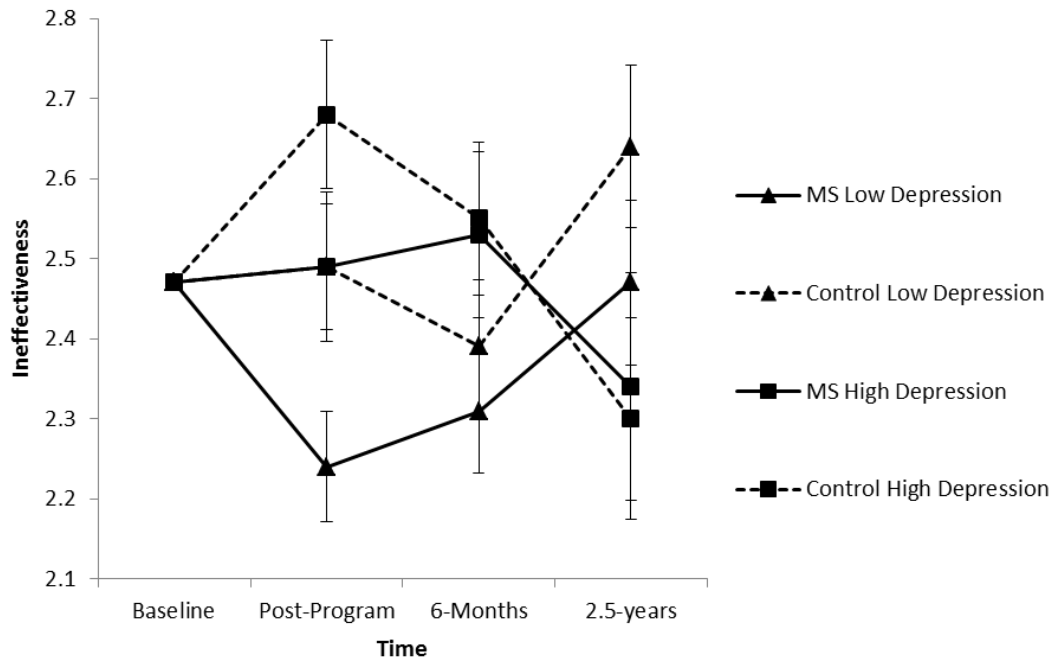


Figure 3. Ineffectiveness scores by group (2), baseline depression levels (2) and time (3).