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Adherence to the MoodGYM Program: Outcomes and Predictors for an Adolescent
School-Based Population.

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Abstract

Background: Program adherence has been associated with improved intervention outcomes for mental and physical conditions. The aim of the current study is to investigate adolescent adherence to an Internet-based depression prevention program in schools to identify the effect of adherence on outcomes and to ascertain the predictors of program adherence.

Methods: Data for the current study ($N = 1,477$) was drawn from the YouthMood Project, which was conducted to test the effectiveness of the MoodGYM program in reducing and preventing symptoms of anxiety and depression in an adolescent school-based population. The current study compares intervention effects across three sub-groups: high adherers, low adherers and the wait-list control condition.

Results: When compared to the control condition, participants in the high adherence intervention group reported stronger intervention effects at post-intervention and 6-month follow-up than participants in the low adherence group for anxiety ($d = 0.34-0.39$ vs. $0.11-0.22$), and male ($d = 0.43-0.59$ vs. $0.26-0.35$) and female depression ($d = 0.13-0.20$ vs. $0.02-0.04$). No significant intervention effects were identified between the high and low adherence groups. Being in Year 9, living in a rural location and having higher pre-intervention levels of depressive symptoms or self-esteem were predictive of greater adherence to the MoodGYM program.

Limitations: The program trialled is Internet-based and therefore the predictors of adherence identified may not generalise to face-to-face interventions.

Conclusions: The current study provides preliminary support for the positive relationship between program adherence and outcomes in a school environment. The identification of significant predictors of adherence will assist in identifying the type of user who will engage most with an online depression prevention program.

Keywords: adherence, adolescent, anxiety, depression, Internet.

Introduction

Anxiety and depression are prevalent and debilitating disorders, which can be effectively prevented and treated through the implementation of prevention and early intervention programs in schools (Calear and Christensen, 2010; Neil and Christensen, 2009). Although widely researched, few school-based evaluations of anxiety and depression prevention programs have evaluated adherence, or attempted to establish the factors that promote it. Exploration of program adherence is important, as greater adherence is associated with improved intervention outcomes for physical and mental health conditions (Hogue et al., 2008; Manwaring et al., 2008).

Hogue and colleagues (2008) found that adolescents who adhered more to two manualised behavioural interventions for substance abuse and related behaviour problems had greater declines in marijuana use and parental reports of fewer internalizing and externalizing problems than those with low adherence. Similar findings were reported in a study of an Internet-based eating disorders prevention program with adolescents and young adults, which found an association between program use and number of weeks of participation, and changes in dietary restraint from baseline to post-treatment (Manwaring et al., 2008).

In analysing the effects of program adherence on outcomes it is also important to identify the predictors of adherence. Ascertaining the predictors of adherence has the potential to identify who engages the most with the program, and could inform the development of strategies to increase program engagement and completion. Much of the current research on the predictors of adherence to intervention programs in adolescent populations is based on physical health. Factors that have been identified as reducing program adherence have included minority race (Drotar and Bonner, 2009; Nock and Ferriter, 2005), and lower social economic status (SES) or income (Drotar and Bonner, 2009; Nock

and Ferriter, 2005). Increased program adherence has been associated with positive illness attitudes and beliefs (Bucks et al., 2009; Drotar and Bonner, 2009), motivation (Kyngas, 2002, 2007), rural location (Neil et al., 2009), and perceived threats to mental or physical well-being (Kyngas, 2002, 2007). Results for age and gender have been inconsistent, with no relationship reported in some studies (Drotar and Bonner, 2009; Kyngas, 2007) and poorer adherence amongst older adolescents (Bucks et al., 2009; Drotar and Bonner, 2009) and males (Neil et al., 2009) reported in others. Disorder severity has also had mixed results, with this factor associated with both lower and higher levels of adherence (Neil et al., 2009; Nock and Ferriter, 2005). Finally, one of the most consistently reported predictors of adolescent adherence has been intervention beliefs and the perception of intervention effectiveness (Bucks et al., 2009; Drotar and Bonner, 2009; Marko et al., 2010; Žugelj et al., 2010). This factor has been positively associated with adherence for adolescent hypertension, cystic fibrosis, asthma and an online depression prevention program in primary care.

No research to date has explored the effect of adherence on symptom outcomes in a school-based population. This may be due to a limited conceptualisation of adherence as it applies to the school environment. Unlike participation in individual or group face-to-face therapy, non-adherence in the school context cannot be defined as leaving or not attending an intervention, as nearly all students will attend and, therefore, “complete” the intervention by virtue of being present in the classroom. Adherence or engagement in school-based programs needs to be reconceptualised in terms of engagement and active participation in program activities. This could be indexed by activities such as the completion of non-compulsory exercises that are integrated into the program. The completion of these exercises reflects a greater level of engagement with a program, in that participants need to apply the strategies and techniques taught in the program to their own experiences. Utilising exercise completion

rates as a means of differentiating levels of adherence to a school-based intervention provides a unique opportunity to explore the effects of adherence on outcome in this population.

Accordingly, the current study sought to use exercise completion rates as a means to investigate adolescent adherence to an Internet-based depression prevention program in schools. Data for the current study was drawn from the YouthMood Project, which was conducted to test the effectiveness of the MoodGYM program (www.moodgym.anu.edu.au), an online cognitive behavioural therapy program, in reducing and preventing symptoms of anxiety and depression in an adolescent school-based population. Intention-to-treat analyses in the YouthMood Project reported significant reductions in depressive symptoms amongst males at post-intervention (Cohen's $d = 0.43$) and 6-months follow-up ($d = 0.31$), and in anxiety for males and females at post-intervention ($d = 0.15$) and 6-months follow-up ($d = 0.25$). No significant effects were reported for depression in females ($d = 0.06$; Calear et al., 2009).

The first aim of the current study is to explore the effect that program adherence has on symptom outcomes in the YouthMood Project. It was hypothesised that greater adherence to the MoodGYM program will result in stronger intervention effects for anxiety and depression. The second aim of the present study is to identify the predictors of adherence to the MoodGYM program in the YouthMood Project. The identification of these predictors may assist in the future development of adherence promotion programs and strategies that are designed to target modifiable risk and protective factors for adherence.

Method

Participants

Thirty schools from across Australia participated in the YouthMood Project during 2006 and 2007 (Calear et al., 2009). Of these schools, 16 (53.3%) were public schools and 26 (86.7%) were co-educational schools. A cluster, stratified randomized controlled design was

employed in the study, resulting in each school being randomly allocated to the intervention or wait-list control condition based on their school type (public or private) and location (rural or urban). An independent statistician randomly allocated schools within each stratum to the intervention or wait-list control condition using a computerised random number generator. The identity of schools was concealed from the statistician during this process.

A total of 1,477 students (651 male, 826 female) aged between 12 and 17 years ($M = 14.34$, $SD = 0.75$) consented to participate in the trial. Of these students, 55% reported being in Year 10, 44% in Year 9 and 1% in Year 11. Approximately 16% of the students reported living on a farm or rural property, while 94% indicated English as their first language. A large proportion of the students (78.3%) reported living with both parents and 30% of students indicated a prior history of depression. Of the 1,477 participating students, 563 (208 male, 355 female) were allocated to the intervention condition and 914 (443 male, 471 female) to the wait-list control condition. Further participant details can be found at Calear et al. (2009).

Measures

Adherence. The MoodGYM program automatically records the commencement and completion of each module and the number of exercises completed in the program. The number of modules completed can range from 0 to 5, and the number of exercises completed can range from 0 to 29. Exercise completion rate was considered a good gauge of adherence to and engagement with the MoodGYM program as exercise completion was not compulsory, whereas the completion of all five modules was expected. High adherence was defined in the current study as the completion of at least 20 exercises, whereas the completion of 19 or fewer exercises was categorised as low adherence. The completion of 20 or greater exercises was considered an adequate measure of high adherence, as it reflects the completion of at least two-thirds of the MoodGYM exercises and reflects the 85th percentile for exercise

completion. Thus, two groups were created to distinguish high (20-29 exercises) and low (0-19 exercises) adherence.

Intervention effects. Intervention effects were assessed using measures of anxiety and depressive symptoms. Anxiety was measured on the Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds and Richmond, 1978), while depressive symptoms was measured using the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977).

The RCMAS is a 37-item self-report questionnaire consisting of 28 items that measure the different components of anxiety and nine items that form a Lie scale. Each item is rated on a dichotomous "Yes/No" scale, with a total scale score calculated by summing the "Yes" responses for the 28 anxiety items. The total scale score on the RCMAS can range from 0 to 28, with higher scores indicating greater levels of anxiety. A Cronbach's alpha of .89 ($n = 1,284$) was attained in the current study at pre-intervention, suggesting high internal consistency.

The CES-D is composed of 20 items that assess the frequency with which symptoms have been experienced during the past week. Items are responded to on a 4-point Likert type scale ranging from 1 (*rarely or none of the time* [less than 1 day]) to 4 (*most or all of the time* [5-7 days]). Total scale scores can range from 0 to 60, with higher scores reflecting more depressive symptomatology. A high level of internal consistency was attained in the current study with a Cronbach's alpha of .90 ($n = 1,320$) at pre-intervention.

Predictors of adherence. The predictors of adherence explored in the current study were pre-intervention levels of anxiety, depressive symptoms, attributional style, mastery, personal depression stigma, alcohol consumption and self-esteem. Attributional style was measured with the 24-item Children's Attributional Style Questionnaire- Revised (CASQ-R; Kaslow and Nolen-Hoeksema, 1991), while mastery was measured with the 7-item Personal

Mastery Scale (Pearlin et al., 1981). Personal depression stigma was measured on the Personal Depression Stigma Scale (DSS-Personal; Griffiths et al., 2004), which consists of nine items. Alcohol consumption and self-esteem were measured with a 6-item version of the Alcohol Use Disorders Identification Test (AUDIT; Miles et al., 2001; Saunders et al., 1993) and Rosenberg's 10-item Self-Esteem Scale (RSES; Rosenberg, 1965) respectively. Sociodemographic variables were also explored and included sex (male = 1, female = 0), age, location (rural = 1, urban = 0), grade (Year 11 = 2, Year 10 = 1, Year 9 = 0), and history of personal depression (yes = 1, no = 0).

Procedure

The YouthMood trial was registered as ISRCTN67189839. Ethical approval for the study was obtained from The Australian National University's human research ethics committee, as well as the state and Catholic education departments responsible for the schools involved in the trial. Written informed consent was required from the student and their parent/guardian for the young person to participate in the trial. All students in the intervention and wait-list control conditions completed a pre-intervention, post-intervention and 6-month follow-up questionnaire.

Students assigned the intervention condition began the MoodGYM program one week after the completion of the pre-intervention questionnaire, while students in the wait-list control condition continued usual classes that were unrelated to the material presented in the MoodGYM program. The MoodGYM program was presented by the usual classroom teacher and was delivered to students over a 5-week period, with one module of the program presented each week during one class period. Following the completion of the 6-month follow-up questionnaire, students in the wait-list control condition were invited to undertake the MoodGYM program. For further trial information please see Caelear et al. (2009).

Statistical analysis

Outcomes by adherence: Pre-intervention comparisons. One-way analysis of variance (ANOVA) and chi-square analyses were performed to identify any pre-intervention differences between the high adherence, low adherence and wait-list control groups. Comparisons were made between pre-intervention levels of anxiety, depressive symptoms, age and gender.

Outcomes by adherence: Anxiety and depressive symptoms. The effect of adherence (high vs. low vs. control) on intervention outcomes were assessed using an intention-to-treat approach. The statistical techniques employed yield an unbiased estimate of the outcomes and assume missing data to be missing completely at random or at random. All analyses were conducted using mixed-model repeated measures (MMRM) analysis of variance (ANOVA), with measurement occasion as a within-groups factor and group (low adherence, high adherence, control) as a between groups factor. School class was included as a random factor to reflect the clustered sampling of students within classes (and schools) to each condition.

Relationships between observations at different occasions were modelled as an unstructured covariance matrix. Error degrees of freedom were calculated with the Satterthwaite method. Planned contrasts were undertaken to compare differences between adherence groups (high and low) and the wait-list control condition in change from pre-intervention to post-intervention and from pre-intervention to 6-month follow-up. Visual inspection of the data was carried out to identify potential outliers at each measurement occasion, as well as outlying change over time. No substantial or influential outliers were identified. The raw residuals of each model were examined with normal probability plots and were found to be within acceptable limits. A total of 1,477 participants were included in these

analyses, with 86 participants forming the high adherence group, 477 participants forming the low adherence group and 914 participants from the wait-list control condition.

Predictors of program adherence. A mixed-model linear regression analysis was conducted to identify the predictors of adherence to the MoodGYM program for participants in the intervention condition. A random intercept for class was included in the analysis to account for the clustering of students with classes (and schools). The total number of MoodGYM exercises completed was utilised as the outcome measure in this analysis. The predictors of adherence explored in the current study included age, sex, location (rural vs. urban), school grade (Year 9 vs. Year 10), personal history of depression and pre-intervention levels of anxiety, depressive symptoms, attributional style, mastery, personal depression stigma, alcohol consumption and self-esteem. All predictors were entered at once into the linear regression analysis, with the coefficient, standard error, and significance level for each predictor reported. All analyses were performed using SPSS Version 19 for Windows.

Results

Exercise completion rate

Table 1 presents the number of MoodGYM exercises completed by participants in the intervention condition. Fifteen percent of participants in the intervention condition completed at least 20 of the 29 exercises in the MoodGYM program.

[Insert Table 1 Here]

Outcomes by adherence

Pre-intervention comparisons. At pre-intervention there were no significant differences between the high adherence, low adherence and wait-list control groups on anxiety, $F(2, 1369) = 0.32, p = .73$, or depressive symptoms, $F(2, 1369) = 0.36, p = .69$. Significant differences were found in the age, $F(2, 1376) = 38.35, p < .001$, and gender, $\chi^2(2) = 19.56, p < .001$, distributions of the high adherence, low adherence and wait-list control

groups at pre-intervention. Participants in the high ($M = 14.57$) and low adherence ($M = 14.55$) groups were slightly older than the participants in the wait-list control condition ($M = 14.20$ years). A larger proportion of the participants were male in the wait-list control condition (48.5%) than in the high adherence (32.6%) and low adherence (37.7%) groups. The effects of age and gender were therefore assessed in each of the MIXED model analyses.

Anxiety. Figure 1 displays the mean RCMAS scores on each measurement occasion for the high adherence, low adherence and wait-list control groups. The overall interaction of group and occasion was significant ($F [4, 1245.7] = 6.81, p = <.001$), indicating different patterns of change for the high adherence, low adherence and wait-list control groups at each measurement occasion. Planned contrasts were conducted to investigate the differences in change from pre-intervention to post-intervention and 6-month follow-up for the high adherence, low adherence and wait-list control groups.

[Insert Figure 1 Here]

The analysis of post-intervention outcomes showed that the participants in the wait-list control condition differed significantly from the participants in the high adherence ($t [1269.9] = 2.79, p = .005$) and low adherence groups ($t [1295.8] = 2.93, p = .003$). The anxiety symptoms of participants in the wait-list control condition increased from pre-intervention to post-intervention, whereas the anxiety symptoms of participants in the high and low adherence intervention groups decreased from pre-intervention to post-intervention. At post-intervention, the RCMAS scores of the participants in the wait-list control condition were on average 1.62 and 0.89 points higher than those of the participants in the high adherence ($d = 0.34, 95\% \text{ CI} = 0.11\text{--}0.57$) and low adherence ($d = 0.11, 95\% \text{ CI} = -0.01\text{--}$

0.23) groups respectively. No significant differences were evident between the high and low adherence groups ($t [1273.8] = 1.20, p = .231; d = 0.24, 95\% \text{ CI} = -0.01-0.48$).

At 6-month follow-up, the wait-list control condition was associated with a smaller reduction in anxiety symptoms than the high adherence ($t [1218.6] = 3.16, p = .002$) and low adherence ($t [1262.7] = 4.25, p = <.001$) groups. On average, the RCMAS scores of the participants in the wait-list control condition were 2.05 and 1.46 points higher than those of the participants in the high adherence ($d = 0.39, 95\% \text{ CI} = 0.16-0.62$) and low adherence ($d = 0.22, 95\% \text{ CI} = 0.09-0.34$) groups respectively. No significant differences were evident between the high and low adherence groups ($t [1224.1] = 0.87, p = .384; d = 0.19, 95\% \text{ CI} = -0.05-0.43$). Age ($p = .88$) and gender ($p = .20$) effects were not included in the final model, as neither produced significant effects and their inclusion does not alter the results of the present model.

Depressive symptoms. The overall interaction of group and occasion was not significant, $F(4, 1240.0) = 1.31, p = .26$, indicating no difference in the patterns of change for the high adherence, low adherence and wait-list control groups. The overall interaction of group, occasion, and gender, however, was marginally not significant, $F(8, 1398.2) = 1.84, p = .06$. A series of planned contrasts were conducted to investigate potential differences between the high adherence, low adherence and wait-list control group at each measurement occasion by gender. Figures 2 and 3 show the mean CES-D scores on each measurement occasion for the high adherence, low adherence and wait-list control groups for males and females respectively.

[Insert Figures 2 and 3 Here]

Planned contrasts at post-intervention showed that the male participants in the wait-list control condition differed significantly from the male participants in the high adherence (t

[1322.4] = 2.69, $p = .007$) and low adherence groups ($t [1304.3] = 2.74, p = .006$). No significant differences were observed between the female wait-list control participants and the female participants in the high adherence ($t [1261.8] = 0.19, p = .85; d = 0.13, 95\% CI = -0.15-0.41$) or low adherence groups ($t [1299.4] = 0.30, p = .76; d = 0.04, 95\% CI = -0.12-0.20$).

The depressive symptoms of male participants in the wait-list control condition increased from pre-intervention to post-intervention, whereas the depressive symptoms of the male participants in the high and low adherence groups decreased from pre-intervention to post-intervention. At post-intervention, the CES-D scores of the male participants in the wait-list control condition were on average 4.88 and 2.28 points higher than those of the male participants in the high adherence ($d = 0.59, 95\% CI = 0.18-0.99$) and low adherence ($d = 0.35, 95\% CI = 0.16-0.54$) groups respectively. No significant differences were evident between the high and low adherence groups for males ($t [1323.3] = 1.37, p = .17; d = 0.42, 95\% CI = -0.01-0.84$), or females ($t [1264.8] = 0.03, p = .98; d = 0.09, 95\% CI = -0.20-0.38$).

At 6-month follow-up, a significant difference was found between the male participants in the wait-list control condition and male participants in the high adherence ($t [1298.0] = 1.98, p = .048$) and low adherence groups ($t [1238.3] = 2.05, p = .041$). No significant differences were observed between the female wait-list control participants and the female participants in the high adherence ($t [1192.1] = 0.17, p = .87; d = 0.20, 95\% CI = -0.09-0.48$) or low adherence groups ($t [1250.1] = 0.75, p = .45; d = 0.02, 95\% CI = -0.14-0.19$).

At 6-month follow-up, the CES-D scores of the male participants in the wait-list control condition were on average 4.04 and 1.87 points higher than those of the male participants in the high adherence ($d = 0.43, 95\% CI = 0.01-0.86$) and low adherence ($d = 0.26, 95\% CI = 0.07-0.45$) groups respectively. No significant differences were evident

between the high and low adherence groups for males ($t [1293.1] = 1.02, p = .30; d = 0.27$, 95% CI = -0.17–0.71), or females ($t [1200.5] = 0.57, p = .57; d = 0.18$, 95% CI = -0.12–0.47). Age ($p = .95$) effects were not included in the final model, as they did not produce significant effects, and their inclusion does not alter the results of the present model.

The aforementioned models were repeated with different cut-points for exercise completions (equating to the 75th and 80th percentiles). The results of these models were the same as those reported above.

Predictors of program adherence

A mixed model linear regression analysis was conducted to identify the predictors of adherence to the MoodGYM program for participants in the intervention condition (high and low adherence groups combined). Adherence was operationalised as the number of exercises completed in the MoodGYM program. Table 2 presents the predictors of adherence to the MoodGYM program for participants in the intervention condition.

[Insert Table 2 Here]

Pre-intervention depressive symptoms, self-esteem, location and grade were significant predictors of adherence, while pre-intervention mastery approached significance ($p = .08$). These findings suggest that participants in the intervention condition who were in Year 9, from a rural area, or had higher levels of depressive symptoms or self-esteem at pre-intervention were more likely to adhere to the MoodGYM program. On average, participants from rural areas completed 1.79 more exercises than participants in urban areas, while participants in Year 9 completed, on average, 2.60 more exercises than participants in Year 10. Participants completed an average 0.10 and 0.18 more exercises for every one point increase in pre-intervention levels of depressive symptoms and self-esteem respectively.

Discussion

The first aim of the current study was to explore the effect that program adherence had on symptom outcomes in the YouthMood Project. It was hypothesised that greater adherence to the MoodGYM program would result in stronger intervention effects for anxiety and depression. This hypothesis was supported. In terms of anxiety, the effect sizes reported for the high adherence group participants, compared to the wait-list control condition participants, were larger at post-intervention ($d = 0.34$) and 6-month follow-up ($d = 0.39$) than those reported for the low adherence group participants, against the wait-list control condition participants, at post-intervention ($d = 0.11$) and 6-month follow-up ($d = 0.22$).

Similar results were reported for male depression. Higher intervention effects were reported for the high adherence group, compared to the wait-list control condition, at post-intervention ($d = 0.59$) and 6-month follow-up ($d = 0.43$) than the low adherence group, against the wait-list control conditions, at post-intervention ($d = 0.35$) and 6-month follow-up ($d = 0.26$).

The intervention effects for female depression were also larger in the high adherence group participants, against the wait-list control condition participants, at post-intervention ($d = 0.13$) and 6-month follow-up ($d = 0.20$) than the low adherence group participants at post-intervention ($d = 0.04$) and 6-month follow-up ($d = 0.02$). This finding suggests that the small non-significant effects observed for females in the full universal sample may reflect females' poor adherence or engagement with the MoodGYM program, rather than the program's ineffectiveness with females, as those females who did complete more of the program exhibited positive effects. Future research with female participants is needed to clarify these results, as a previous pilot trial conducted with female participants found positive effects for depression regardless of exercise completion rates (O'Kearney et al., 2009). Overall, the findings for anxiety and depression support previous research, which also reported improved

intervention effects with increased program adherence (Hogue et al., 2008; Manwaring et al., 2008).

Small to medium effect sizes were observed between the high and low adherence groups for anxiety ($d = 0.19$ – 0.24) and depression in males ($d = 0.27$ – 0.42), further supporting the relationship between adherence and improved intervention outcomes. However, these differences were not significant. The lack of significant findings is likely due to the small sample size in the high adherence group, resulting in insufficient power to detect intervention effects. Future research with a sufficiently large sample size would strengthen the reliability of this observed effect.

The second aim of the current study was to identify the predictors of adherence to the MoodGYM program. It was found that participants in the intervention condition who were in Year 9, from a rural area, or had higher levels of depressive symptoms or self-esteem at pre-intervention were more likely to adhere to the program. The results of this study support previous research, which also found a positive relationship between rural location, disorder severity and adherence (Neil et al., 2009), and the absence of a relationship between adherence, age and gender (Drotar and Bonner, 2009; Kyngas, 2007).

There are a number of possible explanations for the findings in the current study. For instance, participants in rural areas may have adhered more to the program because alternative sources of mental health prevention and support were not available, or they may have had a preference for self-help programs, or the implementation of the program may have been better supervised by the teachers. The increased adherence observed in participants with higher pre-intervention levels of depressive symptoms and self-esteem may reflect a greater motivation amongst highly symptomatic and self-confident participants to complete the MoodGYM program due to its increased relevance and potential benefit to them. Participants with high self-esteem may have benefited from the reinforcement of their positive self-worth,

while those with higher levels of depressive symptoms may have benefited from the acquisition of new skills and techniques to tackle their symptoms of depression. It is unclear why participants in Year 9 adhered more to the MoodGYM program than participants in Year 10. It may be that the teachers of Year 9 students had a greater level of influence and control over them due to their younger age, and therefore were better able to encourage and promote program completion. Alternatively, it may be that the program content is more relevant to the younger age group, and this may reflect maturation or emotional development.

One potential limitation of the current study is that the program trialled is Internet-based and therefore the predictors of adherence identified in this study may not generalise to face-to-face interventions. Further research is required to identify if there are differences in the predictors of adherence between these two mediums. The current study also did not measure a number of the factors purported in the literature as predicting program adherence. These factors included illness attitudes and beliefs, motivation, perceived threats to wellbeing, intervention beliefs and perception of intervention effectiveness (Bucks et al., 2009; Drotar and Bonner, 2009; Kyngas, 2002, 2007; Marko et al., 2010; Žugelj et al., 2010). It is recommended that these variables be included in future research studies to establish their relationship with depression prevention program outcomes. The clarification and identification of additional predictors of adherence would assist in the development of appropriate strategies to improve adherence to Internet-based applications.

It would also be advantageous in future research to look beyond user characteristics and their influence on adherence and consider the effect of environmental factors, support, and website characteristics on program adherence in schools. These factors have been proposed in the Internet Intervention Model as interacting with and influencing website usage (Ritterband et al., 2009). Environmental factors could include school and classroom factors such as class size, class composition (e.g., single sex vs. co-educational), teacher motivation

and enthusiasm, and school resources (e.g., Internet speed and access), while the influence of support on adherence could be tested through the provision of automated reminder or motivational emails to students completing the intervention. Specific website factors that could be assessed include program usability, appeal and content relevance.

Future research should begin trialling strategies and techniques aimed at addressing the modifiable risk and protective factors identified in the literature as affecting adherence. Such strategies could include tailoring a program to a user's stage of change, or providing psychoeducation or therapy preparations sessions to increase motivation prior to program commencement. Psychoeducation could work to address illness attitudes and beliefs, while therapy preparation sessions could focus on a user's intervention beliefs and perception of intervention effectiveness. This research could assist in identifying the mechanisms by which adherence could be improved and maintained.

Lastly, in the current study the terms high and low adherence were used to describe participant engagement with the MoodGYM program. The term adherence was chosen in this context to be consistent with previous literature, which also conceptualised adherence in terms of the amount of an intervention completed, rather than program completion versus drop-out. It should be acknowledged however, that the construct measured could also be reflective of program engagement. There is a need in the literature therefore to better define the terms adherence and engagement, as these terms are often used interchangeably and often have a large degree of overlap.

Conclusion

The current study is one of the first to explore the effect of program adherence on outcomes in a school environment. The results of the current study support the proposed positive relationship between program adherence and outcome (Hogue et al., 2008; Manwaring et al., 2008). Participants in the intervention condition who completed at least 20

exercises of the MoodGYM program displayed stronger intervention effects at post-intervention and 6-month follow-up than those who did not. The current study also contributes to the growing literature on the predictors of adolescent adherence to physical and mental health prevention and treatment programs (Bucks et al., 2009; Drotar and Bonner, 2009; Kyngas, 2002, 2007; Marko et al., 2010; Neil et al., 2009; Nock and Ferriter, 2005; Žugelj et al., 2010). The identification of the predictors of adherence in the current study will assist in understanding which users are most likely to engage with an Internet-based depression prevention program, as well as identify potential modifiable risk and protective factors that could be targeted in future adherence promotion programs to increase program engagement. Increasing program adherence and engagement is central to the effective and efficient delivery of prevention programs in schools and the community.

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