

Move Your Mood:
Effects on Functioning for Adolescents with Depression
by
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Abstract

Depression is a growing problem, affecting 15 to 20 percent of adolescents in the United States before they turn 18-years old. Depression is often associated with impaired functioning (social, academic), which may in turn exacerbate depression. Many adolescents with depression never seek treatment, and those that do often fail to achieve remission from depression. Current research suggests that physical exercise can be used as an alternative treatment option for patients with depression. The present study included a 12-week exercise intervention for 13 adolescents with depression. Depression severity decreased across the entire group, illustrated by a statistically significant decrease in the CDRS-R ($t(12)=8.12, p<.001$) and in the QIDS ($t(12)=2.55, p<.05$). Furthermore, adaptive functioning increased at a statistically significant level across the 12-week intervention ($t(12)=2.39, p<.05$). We conclude that a 12-week exercise intervention was associated with a decrease in depression severity and an increase in adaptive functioning. Limitations and potential for future research are discussed.

Keywords: Adaptive functioning, depression, exercise intervention, physical activity, BMI.

Move Your Mood:

Effects on Functioning for Adolescents with Depression

The World Health Organization describes depression as one of the most debilitating health problems in the world, affecting 340 million people at any given time (Greden, 2001). Depression is often associated with impaired social and academic functioning (Jaycox et al., 2009). Correspondingly, impaired functioning from depression causes significant decreases in functioning in the workplace (Goldberg & Steury, 2001). Thirty-seven to 48 percent of workers with depression experience short term disability during their careers, resulting not only in lost wages for workers but also in unfavorable cost outcomes for employers. And still far greater concerns exist, as those suffering from depression are 22 to 36 times more likely to commit suicide than those who are not suffering from depression (Brown, 2001). To call depression a “growing problem” in today’s culture would be a complete understatement: it is an epidemic.

Depression and Adaptive Functioning

One advancement in modern psychiatry has been an increase in the recognition of depression in children and adolescents. Current estimates report that 15 to 20 percent of American adolescents experience a depressive disorder before their eighteenth birthday (Lewinsohn, Hops, Roberts, Seeley & Andrews, 1993). Furthermore, proactively treating early-onset depression in children and adolescents is paramount as early-onset depression predicts a greater risk for recurrence of depression in adulthood (Greden, 2001).

The experience of depression is very disruptive for an adolescent, particularly in the area of adaptive functioning. For instance, in a study conducted by Puig-Antich et al. (1985), the authors found that prepubertal children suffering from depression exhibited impaired psychosocial relationships with peers and family when compared with a control group of

“normal” children. In other words, children with depression displayed more difficulties engaging in verbal and affective communication with others compared with non-depressed children. Similarly, Jaycox et al. (2009) found that adolescents with depression had greater deficits in social functioning (e.g. peer relationships), family functioning, and academic functioning. Furthermore, they suggest that a decrease in adaptive functioning among adolescents with depression could in fact represent a vicious cycle in which lower adaptive functioning in turn exacerbates depression. In a study comparing 184 adolescents with depression and 184 non-depressed adolescents, Jaycox et al. (2009) found that those in the depressed group reported significantly lower adaptive functioning. Depressed participants and their parents reported lower peer and family functioning. Cutting by thirds, they divided adolescents into low, medium and high levels of depression. Amongst the third with the highest depression, 43 percent had GPAs less than 2.0. In the third with the lowest depression, only 24 percent had a GPA that was less than 2.0. Furthermore, adolescents in the depressed group engaged in higher risk behaviors, resulting in more substance abuse, more pregnancies, more suicide attempts, and more completed suicides. Jaycox et al. (2009) conclude by suggesting that treatment of depression could improve overall adaptive functioning over time.

Current Treatment Options

There are several treatment options for depression including cognitive behavioral therapy, interpersonal therapy (Ryan, 2005), medications such as selective serotonin reuptake inhibitors (SSRIs), or these methods used in combination (March et al., 2004). While these techniques are widely regarded today as effective treatments for depression, many adolescents fail to achieve remission of depression. In the Treatment of Adolescent Depression Study (March et al., 2004), 439 adolescents diagnosed with Major Depressive Disorder (MDD) were

randomized to one of 4 conditions, including a 12-week treatment of fluoxetine, cognitive behavioral therapy, their combination, or a placebo group. The researchers found that after the acute intervention, remission rates were only 23 percent for fluoxetine, 16 percent for cognitive behavioral therapy, 37 percent for the combination group, and 17 percent for the placebo group. Currently, research is being conducted on alternative methods to treat depression. For instance, it has been suggested that the use of exercise in clinical settings might mitigate depression severity, improving a patient's mental health (Penedo & Dahn, 2005).

The Possibility of Exercise as Treatment

Numerous studies have illustrated the profound effects of exercise and physical activity on health and quality of life (Haskell, Montoye, & Orenstein, 1985). Exercise has been shown to increase cardiovascular health and decrease the risks for diseases such as diabetes and obesity (Fletcher et al., 1996). Furthermore, studies suggest the existence of a positive relationship between a physically active lifestyle and other positive health behaviors (Haskell et al., 1985). For instance, after working out at the gym, it may become easier to avoid an unhealthy snack, since exercise has primed a desired possible self (Oyserman & James, 2009).

There is very little dispute concerning the benefits related to exercise and one's physical health; however, could exercise have positive effects on one's mental health? Recent evidence suggests that it can. Babiss and Gangwisch (2009) suggest that physical activity can protect against depression in adolescents by increasing endorphin levels, raising self-esteem, expanding social support, and deterring substance abuse. Weyerer (1992), after controlling for potential confounds, found that the likelihood for depression was significantly higher for physically inactive adolescents compared to regular exercisers. Recent studies have shown that adults with depression in physical activity interventions in clinical settings show better health outcomes,

including better general health, better quality of life, better functional capacity, and better mood states (Penedo & Dahn, 2005). Furthermore, Babyak et al. (2000) assert that among individuals with MDD, an exercise intervention would be associated with significant therapeutic benefit, particularly if the exercise is continued over time. Physical activity, therefore, could potentially be a very effective treatment method for depression.

There are many reasons to consider exercise and lifestyle changes in our society and culture. For instance, since the 1990s, there has been a steady increase in the prevalence of obesity in the United States (Mokdad et al., 1999). And what is the cause of this? Studies have shown that the rise of television and internet corresponds with the rise in obesity among adolescents. Computing data of adolescents between the ages of 12 and 17 from the National Health Examination Survey, Dietz and Gortmaker (1985) found that the likelihood of obesity increased 2 percent for each hour of television that the adolescent viewed per day. Furthermore, this association persisted when controlling for prior obesity, region, race, socioeconomic class, and genetic information. Therefore, these researchers suggest that television viewing may have a causal relationship with obesity; adolescents watching television at home burn far fewer calories than those playing outside with friends.

Several studies have shown obesity to be a significant predictor of depression (Brausch & Muehlenkamp, 2007). In addition, Brausch and Meuhlenkamp (2007) found that across gender, body image was the strongest predictor of suicidal ideation among other risk factors. They suggest that adolescents who view their bodies negatively might develop a disregard or hate for their bodies, making suicide a more feasible option during times of stress. Another reason that obese adolescents are more likely to suffer from depression is that they are more likely to be the victims of bullying behaviors than their peers of normal weight (Janssen, Craig, Boyce, &

Pickett, 2004). These studies indicate that obesity among adolescents is a real contributor to depression.

While several studies highlight obesity as a causal force behind depression, studies have also suggested that depression may cause obesity. In a meta-analysis of longitudinal studies involving depression and obesity, Blaine (2008) found support for this assertion. Analyzing 16 related studies, he found that adolescents with depression compared with adolescents without depression are at a much higher risk for developing obesity, particularly amongst adolescent females. Furthermore, he found that the effect of adolescent depression on obesity is greater than the effect of second hand tobacco smoke on cancer. Therefore, it appears that depression contributes to obesity and obesity contributes to depression.

Apart from countering obesity, a clinical exercise intervention might be effective in raising social capital among adolescents (Putnam, 1995). Children and adolescents across the United States are staying inside more often than before. They are watching television, surfing the internet, or talking on the phone. Some have argued that these activities make it virtually impossible for people to form the types of relationships that yield social capital (Iyengar & McGrady, 2007). Social capital is defined as the norms and values intrinsic to people that result in, or are the result of, collective social ties and relationships (Edwards, 2002). In addition, several critics argue that television and the internet are directly responsible for a decline in social capital (Iyengar & McGrady, 2007). At the same time, increased social capital might serve as a protective force against depression. For example, Runyan et al. (1998) found that among children in unfavorable home environments such as low socioeconomic status and one parent homes, those who experienced higher social capital from peers, family, and neighbors benefitted from positive developmental and behavioral outcomes. Furthermore, higher levels of perceived

peer support are expected to correlate with lower levels of suicidal ideation and depression (Kerr, Preuss, & King, 2006). An exercise intervention could be beneficial in this matter. Simply interacting with the researcher could increase social capital, thus increase perceived support and social functioning. Furthermore, an exercise intervention would essentially permit interaction with others, thus potentially increasing peer relations and mitigating depression.

In addition to its potential to decrease depression and increase social functioning, increased physical activity might contribute to improved scholastic performance. In a study conducted by Dwyer, Sallis, Blizzard, Lazarus and Dean (2001), a potential causal link was suggested between physical activity and academic functioning. In this study, scholastic ability was measured (usually by the principal of the school) for a representative sample of 7,961 school-aged children in Australia between the ages of 7 and 15. Subsequently, they were evaluated and compared on their completion of a variety of athletic tests to determine cardiovascular endurance, strength, explosiveness, and power. They found that adolescents who exhibited greater academic functioning also experienced better overall physical health. While these results are correlational, a causal relationship between exercise and academic functioning was suggested. They suggest that lower plasma noradrenaline and potentially an increase in the transfer of tryptophan across the blood-brain barrier due to an increase in physical activity might produce a calming effect that can assist in focusing on academics. However, since the nature of these observations is cross-sectional, the extent of a causal relationship is speculative. Furthermore, they did not distinguish between depressed and non-depressed adolescents. Nevertheless, if increased physical activity is associated with increased academic functioning among all adolescents, then physical activity may increase academic functioning for adolescents with depression.

Current Insufficiency of Evidence

The aforementioned examples illustrate how a clinical exercise intervention might be effective in decreasing depression in adolescents. However, using the Cochrane Controlled Trials Register, Larun, Nordheim, Ekland, Hagen and Heian (2006), found that current evidence regarding the effectiveness of exercise on depression in adolescents is circumstantial and insufficient. They assert that the relatively few studies that have been conducted and the clinical diversity of the participants detract from the validity of the conclusions. Furthermore, they assert that more research on the matter is needed.

The Present Study

The goal of this research study is to examine the effects of an exercise intervention on adolescents with depression. Due to the vicious cycle between increased depression and decreased overall adaptive functioning most aptly characterized by Jaycox et al. (2009), we have focused on the effects that an exercise intervention might have on overall adaptive functioning. We hope that an exercise intervention will be associated with a decrease in depression severity and an increase in adaptive functioning. We define adaptive functioning in terms of peer relationships, family relationships, academic performance, and home duties/self care. For adolescents with depression who participated in a 12-week exercise intervention, we hypothesize that overall adaptive functioning will increase from baseline to 12-weeks, and continue to increase up to the 6-month follow-up. More specifically, we hypothesize that these adolescents will report increased functioning with peers, with families, in school, and at home. Exploratory analyses will examine the changes in depression severity, self-reported physical activity, suicidal ideation, and body mass index (BMI) that occur throughout the intervention. We hope that the

results of this study will provide further support for the utility of exercise in a clinical setting for adolescents with depression.

Method

Participants

The Institutional Review Board (IRB) granted approval for this study on March 9, 2010. Potential participants were recruited for an exercise intervention via flyers distributed at local high schools and mental health clinics. Subsequently, telephone screens were conducted with 25 adolescents in order to determine the levels of his or her depression severity and physical activity. Of these 25 adolescents, 11 were excluded from the study due to elevated activity levels, unwillingness to exercise at the level required for the intervention, failure to respond to attempts to establish initial interviews, lack of depression, diagnosis of bipolar disorder, and unwillingness to ask parents for consent to participate in the study. Adolescent assent and parental/guardian consent were obtained from 14 adolescents including 4 males and 10 females. For these 14 adolescents, half of the initial telephone screening contacts were initiated by the parent and half by the adolescent. For the males, 75 percent of the initial contacts were made by parents, while for the females, 40 percent of the initial contacts were made by parents. At this point, demographic information was obtained from each adolescent. Of these 14 adolescents, 1 was excluded since she sustained an orthopedic injury prior to the exercise intervention. The final total number of participants was thereby reduced to 13.

The 13 participants who participated in this exercise intervention for depression consisted of 9 females and 4 males. The age range was between 13 and 17 years ($M=15.2$ years, $SD=2.4$ years). The group was comprised of the following races and ethnicities: Caucasian (54%), African-American (23%), Bi-racial (15%), and Hispanic (8%). Of the participants, 11 met the

criteria for MDD and 2 met the criteria for Depressive Disorder, Not Otherwise Specified. Four participants with MDD also had a co-morbid diagnosis: 1 with Attention-Deficit/Hyperactivity Disorder (ADHD), 1 with Anxiety Disorder, Not Otherwise Specified, and 2 with ADHD and Anxiety Disorder, Not Otherwise Specified.

At baseline, 9 of the participants were already in treatment for their depression, receiving either psychotherapy or medication. Five participants were taking SSRIs (4 on fluoxetine and 1 on sertraline) from the beginning to the end of the study. One participant began using the SSRI sertraline around the 3-week point of the intervention, and 2 participants underwent psychotherapy during the intervention. Seven participants were not taking any psychotropic medications throughout the study. Two participants terminated their psychotherapy during the intervention, citing better mood as their reason. Both of these participants were not taking medications during the study.

The adolescents were given monetary incentive for participation in this study. Each participant spent 4 nights in the sleep lab at the medical center of a large, midwestern university, 2 nights pre-intervention and 2 nights post-intervention. They were compensated \$50 for each night spent in the lab. Also, participants were compensated \$10 for each exercise session, and \$10 for participation in the 6-month follow-up session. All payments were made in cash.

Participants received a total sum of \$330.

Before the exercise intervention began, 10 out of 13 of the participants were considered overweight or obese, according to the Center for Disease Control and Prevention (CDC) BMI calculator. Only 3 participants were in the normal weight category. Post-intervention, 6 participants were in the normal weight category. During the study, 8 out of the 13 participants lowered their BMI.

Materials and Apparatus

Treadmill. The treadmill used in this exercise intervention was a Nordic Track model 7000 R.

Elliptical. The elliptical machine used in this exercise intervention was a PRECOR EFX® 546i.

Stationary Bicycle. The stationary bicycle used in this exercise intervention was a Giant Tempo™.

Measures

Children's Depression Rating Scale, Revised (CDRS-R; Poznanski & Mokros, 1996). The CDRS-R was used in order to determine adolescent depression symptoms through a semi-structured interview by a clinician. In the present study, two staff members administered the CDRS-R at baseline, after the 12-week intervention, and 3-months post-intervention, recording their ratings separately. This measure evaluates potential symptoms of depression, ranging from sleep disturbance to morbid ideation. A higher score on the CDRS-R indicates an increased likelihood of clinical depression. This measure has been shown to have parallel validity with other measures of adolescent depressive severity. After each time point, the staff members compared their ratings and determined a consolidated score. This measure had an internal consistency measure of 0.85 and inter-rater reliability that is measured at 0.80. See Appendix A for a sample CDRS-R form.

Quick Inventory of Depressive Symptomatology, Self-Report (QIDS; Rush et al., 2003). The QIDS is a brief, self-report measure of depression severity. The QIDS has highly acceptable psychometric properties, supporting its usefulness in clinical settings. It tends to focus on the neurovegetative aspects of depression. This measure has high internal consistency

and is shown to be a reliable measure of depression severity among adolescents (Bernstein et al., 2010). See Appendix B for a sample QIDS survey.

Child and Adolescent Social and Adaptive Functioning Scale (CASAFS; Price, Spence, Sheffield & Donovan, 2002). The CASAFS is a measure that is intended to examine adaptive functioning in adolescents. It is a self-report inventory comprised of 24 items, asking the degree to which the individual fulfills particular roles in his or her life. Responses to each adaptive functioning item are coded on a 4-point scale: 1 (never), 2 (sometimes), 3 (often) and 4 (always). Adaptive functioning was measured using 4 subscales, including academic performance, peer relationships, family relationships, and home duties/self care. Example statements of each subscale are as followed: “I get good marks in Math/Arithmetic” (academic performance), “I go out with my friends” (peer relationships), “I have a good relationship with my mother” (family relationships), and “I keep my room and belongings tidy” (home duties/self care). Findings show that the CASAFS is reliable, valid, and sensitive to the influence of depressive disorders (Spence, Sheffield & Donovan, 2003). See Appendix C for a sample CASAFS survey.

Suicidal Ideation Questionnaire-Junior (SIQ-JR; Reynolds, 1988). The SIQ-JR is comprised of a 15 item self-report questionnaire measuring the frequency of suicidal thoughts. Examples of questions measuring suicidal ideation include “I thought that no one cared if I lived or died” and “I have thought about killing myself.” Responses were measured on a 7-point scale, ranging from never having the thought to having the thought on a daily basis. The total scores have well-documented psychometric properties that have potential to predict suicidal thoughts and behaviors for up to 6-months post-hospitalization (Reynolds, 1988; King, Hovey, Brand, Wilson, & Ghaziuddin, 1997). See Appendix D for a sample SIQ-JR survey.

Physical Activity Questionnaire for Older Children (PAQ-A; Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997). The PAQ-A is a self-report questionnaire that measures an individual's physical activities in the previous week. It asks questions related to the level of participation in organized and recreational sports, the activities pursued during "free time," and the level of participation in physical education classes. The PAQ-A has high internal consistency and is shown to be a reliable predictor of physical activity. This measure was modified to include various forms of physical activity in the study region. See Appendix E for a sample of the adapted PAQ-A survey.

Body Mass Index (BMI; Centers for Disease Control and Prevention (CDC)). BMI is a widely used measure of health, calculated by weight in kilograms divided by height in meters, squared (Swallen, Reither, Haas & Meier, 2005). When BMI is assessed within age and gender groups, it has been shown to be a statistically valid measure of obesity among adolescents. We used the Center for Disease Control and Prevention BMI calculator, using participants' heights, weights, dates of birth, and genders. At risk for overweight is defined as between the 85th and 95th percentiles for BMI, while overweight is defined as above the 95th percentile for BMI.

Procedure

Pre-exercise intervention. Baseline interviews were conducted for both adolescents and a parent/legal guardian. Subsequently, the adolescents completed self-report measures, including QIDS, CASAFS, SIQ-JR, and PAQ-A, while the staff conducted the CDRS-R interview and computed each participant's BMI. Medical approval was sought and obtained by each participant's primary care physician.

Exercise intervention. The exercise lab is located in the medical center of a large, midwestern university. In the first week, participants came to the exercise lab for 3 scheduled

exercise sessions. Each exercise session was supervised by one of the clinical staff members. In each exercise session, participants engaged in physical activity using a treadmill, an elliptical machine, or a stationary bicycle. Each exercise session lasted between 45 and 60 minutes. The only people present at these exercise interventions were staff members, who were there to supervise, monitor safety, and check participants' heart rates every 10 minutes.

In the second week, participants engaged in 2 exercise sessions in the exercise lab, and conducted 1 exercise session on their own at their respective homes. Each session, whether at home or in the lab, lasted between 45 and 60 minutes. For the subsequent 10 weeks, participants engaged in 1 supervised session at the exercise lab, and 2 unsupervised sessions on their own. Each week, a staff member would discuss with the participants what exercise sessions were accomplished independently. They then assisted the participant in planning the independent, unsupervised sessions for the following week.

The first participant began the intervention in October of 2008, and the last participant finished the intervention in May of 2009. The 6-month follow-up appointments were conducted in the summer of 2009, between May and September. Each participant completed his or her exercise session at the exercise lab or at home individually. Finally, during the intervention, participants were asked to give reasons for their desired participation in the study.

Post-exercise intervention. Approximately 3-months after the end of the exercise intervention, participants returned to the exercise lab for a final assessment. Again, respective measures were recorded by the participants and the clinical staff members.

Statistical Analysis

Paired samples *t*-tests were conducted to compare means of baseline with post-intervention and baseline with the 6-month follow-up. The following measures were compared

in paired samples *t*-tests: CDRS-R, QIDS, CASAFS, SIQ-JR, and PAQ-A. Furthermore, BMI for each participant was assessed pre- and post-intervention. Finally, Pearson's two-tailed correlations were used in order to examine the relationship between depression severity and adaptive functioning.

Results

Feasibility

Every participant who began the study completed the intervention, taking an average of 14.25 ($SD=3.1$) weeks. Due to some complications such as illness, transportation problems, minor injuries or high academic demands, some participants took longer than the 12-weeks to complete their 15 supervised sessions and 21 independent sessions. Other complications arose, such as temporary homelessness, parental separations, a suicide attempt, and a police arrest.

Participants were asked to explain why they wished to partake in the study. The participants gave the following reasons: a structured exercise regimen, desired weight loss, incentive money, to lessen depression severity, to be involved in research, and to help others. Furthermore, in 4 cases, participants or parents desired participation in the study as an alternative to medication.

Depression, Suicidal Ideation, and Physical Activity

The primary outcome measures for depression were the CDRS-R and the QIDS. During the 12-week exercise intervention, depression severity among the adolescents decreased (see Table 1). In the CDRS-R, mean scores decreased significantly from baseline to 12-weeks ($t(12)=8.12, p<.001$). The mean score on the CDRS-R for the adolescents decreased from 48.85 ($SD=9.65$) to 28.54 ($SD=10.36$).

The QIDS also noted a significant decrease in depression from baseline to 12-weeks ($t(12)=2.55, p<.05$). The mean score on the QIDS for the adolescents decreased from 10.23 ($SD=4.53$) to 7.77 ($SD=5.51$). The CDRS-R and QIDS measures were highly inter-correlated both at baseline ($r=.71, p<.01$) and at 12-weeks ($r=.95, p<.001$).

Suicidal ideation among the adolescents was measured using the SIQ-JR. The mean score on the SIQ-JR decreased from 16.00 ($SD=9.80$) to 13.46 ($SD=12.02$); however, these results were not statistically significant.

Scores on the adapted PAQ-A increased significantly ($t(12)=5.14, p<.001$) throughout the intervention (see Table 1). At baseline, the mean score was 1.46 ($SD=.46$) which raised to 2.12 ($SD=.36$) post-intervention.

Adaptive Functioning

The primary adaptive functioning measure was the CASAFS total score. When comparing mean total scores on the CASAFS, there was a significant increase in overall adaptive functioning from baseline to post-intervention ($t(12)=2.39, p<.05$). Table 1 illustrates this increase from a mean score of 65.00 ($SD=9.68$) to a mean score of 68.85 ($SD=10.46$). We also examined adaptive functioning 3-months after the exercise intervention was complete. The average adaptive functioning score continued to rise to 69.54 ($SD=7.78$).

Peer relationships. Mean peer relationship sub-scores rose from 17.77 ($SD=2.68$) to 18.69 ($SD=2.93$). These results were not statistically significant; however, the peer relationship sub-scores rose significantly ($t(12)=4.94, p<.001$) from baseline to 19.92 ($SD=2.50$) at the 6-month follow-up.

Family relationships. Mean family relationship sub-scores rose from baseline to post-intervention, illustrating a statistical trend ($t(12)=2.03, p=.065$). Mean sub-scores rose from

14.23 ($SD=3.42$) to 15.54 ($SD=2.50$). Mean sub-scores fell to 15.00 ($SD=2.27$) at the 6-month follow-up.

Academic performance. While the mean academic performance sub-scores did raise, results were not statistically significant. Mean academic sub-scores rose from 16.62 ($SD=3.55$) to 17.23 ($SD=3.52$). These scores rose slightly to 17.31 ($SD=2.56$) at the 6-month follow-up; however, this increase was also not statistically significant.

Home duties/self care. The mean home duties/self care sub-scores rose from 16.38 ($SD=4.05$) to 17.54 ($SD=3.97$), illustrating a statistical trend ($t(12)=1.93, p=.077$). These scores fell to 17.31 ($SD=3.84$) at the 6-month follow-up.

Relationship between Adaptive Functioning and Depression

Several correlations exist between the two measures for depression (CDRS-R and QIDS) and the adaptive functioning measure (CASAFS), supporting their relationships (see Table 2). At baseline, the QIDS inversely trended with the CASAFS total score ($r=-.55, p=.054$). Correspondingly, the CDRS-R was inversely related to the CASAFS total score at 12-weeks ($r=-.64, p<.05$). This indicates that the main adaptive functioning measure was related to at least one of the depression measures, both at baseline and at 12-weeks.

Respectively, several of the subscales for adaptive functioning were related to the depression measures (see Table 2). The CDRS-R inversely trended with the CASAFS subscale for peer relationships at baseline ($r=-.54, p=.059$), and was inversely correlated with the CASAFS subscale for peer relationships at the 12-week point ($r=-.62, p<.05$). Furthermore, the QIDS was inversely correlated with the CASAFS subscale for family relationships both at baseline ($r=-.58, p<.05$) and at the 12-week point ($r=-.75, p<.01$). Finally, the QIDS was inversely correlated with the CASAFS subscale for academic performance at baseline ($r=-.56,$

$p < .05$), while the CDRS-R trended with the CASAFS subscale for academic performance at the 12-week point ($r = -.50, p = .083$).

Finally, several of the CASAFS subscale measures were inter-correlated. At week 12, the CASAFS subscale for school performance was strongly related to the subscale for peer relationships ($r = .71, p < .01$) and to the subscale for home duties/self care ($r = .60, p < .05$). Furthermore, at week 12, the CASAFS subscale for peer relationships was highly correlated with the subscale for home duties/self care ($r = .71, p < .01$).

Discussion

Our most profound finding was that over the course of this exercise intervention, adolescents with depression experienced a significant increase in overall adaptive functioning from baseline to 12-weeks. Furthermore, adaptive functioning continued to rise at the 6-month follow-up. More specifically, there were several trends among the 4 subscales of the adaptive functioning measure, but these were not statistically significant. Therefore, we can only partially accept our hypothesis.

In the present study, it is important to note that every participant who began the exercise intervention completed the 12-week study, along with the 6-month follow-up. This was a very involved study that required the participant to take initiative in order to complete the requirements. Since all 13 participants completed 15 supervised and 21 independent exercise sessions, this study demonstrates that an exercise intervention study is feasible. Participants provided several reasons beyond incentive money for wishing to partake in an exercise study, including losing weight, having structured exercise, and alleviating depression severity. Therefore, there appears to be personal motivation behind partaking in a study of this caliber.

As depicted in Figure 1, throughout the course of the 12-week intervention, depression severity greatly decreased. This finding is consistent with other research that supports the effects of exercise on depression severity (Penedo & Dahn, 2005). In our study, both the clinician and self-report measures show that depression decreased significantly. Furthermore, these measures were inter-correlated at both baseline and at 12-weeks, heightening the reliability of these measures in predicting depression. Using the clinician and self-report measures for depression, this study suggests that an exercise intervention can be beneficial in decreasing depression severity.

Suicidal ideation decreased throughout the intervention; however, results were not significant. It is important to note that suicidal ideation is a symptom of depression and not a measure of depression itself. Therefore, it remains plausible that depression could decrease significantly without parallel changes in suicidal ideation.

Physical activity increased during the intervention; however, this is not very surprising, considering that potential participants were screened prior to the intervention in order to select adolescents who at the time did not exercise on a regular basis. Regardless, this measure was important in that it dictates that the participants felt that they were more active and athletic during the 12-week study.

As illustrated in Figure 2, overall adaptive functioning among the entire group increased significantly from baseline to 12-weeks. Mean scores for the participants increased 3.85 points in the 12-week intervention. While this increase might not seem very significant, it corresponds with other research that reports a 3 point increase on the CASAFS measure as highly significant (Spence et al., 2003). Furthermore, mean scores continued to rise, as reported in the 6-month

follow-up data. These results indicate that the exercise intervention may have improved adaptive functioning throughout the 12-weeks of the study and 3-months post-intervention.

The second component of our hypothesis focused on the 4 subscales of adaptive functioning. These include peer relationships, family relationships, academic performance, and home duties/self care.

Sub-scores for peer relationships increased, although not significantly, from baseline to 12-weeks. Mean peer relationship scores did however continue to increase through the 6-month follow-up, and were significant when compared to the report at baseline. We suggest that peer relationships do not form overnight, and perhaps the effects of the intervention might be experienced after the study had completed. We realize that the development and maintenance of peer relationships are complicated. Kerr et al. (2006) found that adolescents with depression will often perceive their families as less engaged, affectionate and supportive than non-depressed adolescents, suggesting that they might seek additional support from non-familial peer relationships. Furthermore, Slavin and Rainer (1990) found that particularly among adolescent females, higher social support from peers predicted lower depression severity. The mere interaction with the researcher during the intervention could be perceived as non-familial social support, thereby potentially increasing social capital. Kerr et al., (2006) do however caution the effect that increased peer relationships might have on females. They suggest that while friendships may compensate for lack of family support, associations with deviant peers could potentially increase tendencies toward substance abuse, delinquency, and violence (Harter, 2004; Kerr et al., 2006), which in turn could exacerbate the severity of depression (Mykletun et al., 2007). So while peer relationships rose and depression fell, the significance of family relationships should also be stressed in order to increase the chances for depression remission.

Examining family relationships, we found that mean sub-scores rose from baseline to 12-weeks, indicating a statistical trend. However, mean sub-scores fell from 12-weeks to the 6-month follow-up. Perhaps the ongoing increase in peer relationships from post-intervention to the 6-month follow-up overcompensated for family relationships during this time period, as signified by the slight decline in family relationship sub-scores. It is also possible that the structure of the exercise intervention and weekly interactions with the research staff may have supported stronger family relationships during the intervention phase; loss of this structure and support after the intervention may have influenced the decrease in adaptive functioning in family relationships.

We did not find any profound results that signified an increase in academic performance. While mean academic functioning scores did rise from baseline to 12-weeks, and again at the 6-month follow-up, results were not statistically significant. While we can only speculate, we suggest that the timing for the 12-week results might be responsible for this. Many of the participants began the intervention at the beginning of their second semesters in school, where they had a clean academic record. At the time that the 12-week data was collected, many participants were finishing up the school year and in the process of studying for final exams. This could add stress, thus potentially complicating the results at the 12-week point. Therefore, we are not sure whether exercise can improve academic performance among depressed adolescents; however, we remain hopeful that it can, and still support a possible causal link between exercise and improved academic functioning, previously noted by Dwyer et al. (2001). We assert that future research is needed in this domain.

Finally, examining the last subscale for adaptive functioning, home duties/self care, we found that mean scores increased from baseline to 12-weeks, indicating a statistical trend;

however, mean scores fell from the 12-week point to the 6-month follow-up. Looking at males and females separately, males reported a much lower baseline sub-score than females.

Furthermore, from baseline to 12-weeks, male sub-scores increased 2.75 points, yet they were still below the baseline female sub-scores. This makes it very difficult to interpret the data.

However, the fact that females reported higher initial scores than males is consistent with previous research, which suggests that young adolescent females engage in more grooming practices than young adolescent males (Duckett, Raffaelli, & Richards, 1989). Furthermore, Duckett et al. (1989) report that as females get older, they become more motivated to participate in household chores, while males do not share this experience. Obviously, since we only have 13 participants comprised of 9 females and 4 males, we cannot make any profound assertions as to the significance of this data when segregating by gender. We suggest that future research be conducted involving more participants in order to be able to effectively make comparisons by gender.

Consistent with other research, our depression measures and our adaptive functioning measures were inter-correlated (see Table 2). At baseline and at 12-weeks, adaptive functioning was related to self-report and clinician measures for depression. Although the relationship between adaptive functioning and depression only signified a statistical trend at baseline, we believe that adaptive functioning and depression are related. This is consistent with other research that identifies a relationship between adaptive functioning and depression (Jaycox et al., 2009).

Furthermore, several subscales of adaptive functioning were correlated with depression measures. Functioning in peer relationships was inversely related to depression at both baseline and at 12-weeks, illustrating that higher perceived peer support predicted lower levels of

depression. Also, family relationships were inversely correlated with depression at baseline and at 12-weeks. Finally, academic functioning inversely trended with depression at baseline and was inversely correlated with depression at week 12. We are not sure whether decreased depression increases functioning or increased functioning lowers depression; however, these measures are related to one another.

Correspondingly, several of the CASAFS subscales were inter-correlated. For instance, at 12-weeks, academic performance was highly related to peer relationships, meaning that higher self-perceived success in school corresponded with better self-perceived relationships with peers. Strong correlations also existed between academic performance and home duties/self care at 12-weeks, along with peer relationships and home duties/self care at 12-weeks.

Finally, we examined changes in BMI from baseline to 12-weeks. As noted earlier, several studies have established the relationship between BMI and depression (Blaine, 2008; Brausch & Muehlenkamp, 2007; Janssen et al., 2004). Eight out of 13 participants in the study lowered their BMI and 3 participants were added to the healthy weight category according to the CDC. This trend occurred in conjunction with lowered depression severity at 12-weeks. These findings suggest that weight loss and lowered depression severity may be related to each other.

Limitations and Future Research

The most obvious limitation we encountered was the reduced sample size in the intervention. We only had 13 participants who engaged in the intervention, including 9 females and 4 males. For this reason, we were not able to make comparisons by gender using independent samples *t*-tests. Regardless, the fact that we found statistically significant results when comparing means across such a small group is especially telling. Therefore, we believe that the fact that adaptive functioning rose and depression severity fell at statistically significant

levels suggests that the two are related. Nevertheless, future research should conduct a study with a larger sample size.

Similarly, another limitation of the study was the fact that there was no control group. We are unable to discuss whether or not an increase in adaptive functioning is a result of the exercise intervention or a result of decreased depression. Therefore, we are unable to make causative claims. Future research is needed in order to determine this scenario.

Third, since a staff member was present throughout the exercise sessions, both supervising and motivating at times, we cannot conclude whether or not the decrease in depression and rise in adaptive functioning was a result of the exercise or personal contacts. Non-familial support and motivation could potentially alleviate depression severity (Kerr et al., 2006). While it would be interesting to see results without the presence of a staff member supervising, it would not really be feasible without jeopardizing the safety of the participant. Perhaps utilizing a video camera would be beneficial, as the staff member can simply observe from another room; however, we believe that the actual presence of a supervisor greatly reduces liability.

Fourth, in our assessment, we do not believe that BMI is the best predictor for obesity. As we have observed and several other studies have noted, there are several problems with using BMI in studies assessing healthy weight. Daniels, Khoury and Morrison (1997) noted that BMI does not translate across gender and ethnic groups in predicting body fat percentage. For instance, with an equal BMI, Caucasian males typically have more body fat than African-Americans, and females typically have more body fat than males. Also, high muscle content can elevate a BMI score (Ode, Pivarnik, Reeves, & Knous, 2007). Therefore, we assert that in future

studies, if BMI is used, it should be used in conjunction with other measures, such as those that measure body fat percentage or mid-abdominal circumference.

Finally, adolescents who participated in the study were not representative of all clinically depressed adolescents. Some of the adolescents were excluded due to elevated activity levels and unwillingness to exercise at the required intensity. Therefore, this was a select sample of participants.

Conclusions

We have shown that through the course of a 12-week exercise intervention, depression decreased and adaptive functioning increased. Adaptive functioning continued to increase in the 3-months following the exercise intervention. Furthermore, our data suggest that our adaptive functioning and depression measures are inversely related. Future research should examine the effects of an exercise intervention across a larger sample size and should also include a control group in order to better understand if exercise has a causal influence on adaptive functioning and depression severity amongst adolescents with depression.

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Table 1

Means and Standard Deviations for Measures from Pre- to Post-Intervention

Participants	<u>CDRS-R</u>		<u>QIDS</u>		<u>PAQ-A</u>		<u>SIQ-JR</u>		<u>CASAFS</u>	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
<i>M</i>	48.85	28.54	10.23	7.77	1.46	2.12	16.00	13.46	65.00	68.85
<i>SD</i>	9.65	10.36	4.53	5.51	0.46	0.36	9.80	12.02	9.68	10.46

Note. Pre: pre-intervention; Post: post-intervention at 12-weeks.

CDRS-R: Children's Depression Rating Scale, Revised; QIDS: Quick Inventory of Depressive Symptomatology, Self-Report; PAQ-A: Physical Activity Questionnaire for Older Children; SIQ-JR: Suicidal Ideation Questionnaire-Junior; CASAFS: Child and Adolescent Social and Adaptive Functioning Scale. Higher scores on CDRS-R, QIDS, and SIQ-JR suggest greater dysfunction. Higher scores on PAQ-A suggest greater physical activity. Higher scores on CASAFS suggest greater adaptive functioning.

Table 2

Correlations Between Measures of Adaptive Functioning and Depression

	<u>CASAFS</u>		<u>CASAFS-PR</u>		<u>CASAFS-FR</u>		<u>CASAFS-AP</u>		<u>CASAFS-HS</u>	
Depression	B1	12W	B1	12W	B1	12W	B1	12W	B1	12W
CDRS-R										
B1	-.46	-.44	-.54*	-.42	-.33	-.37	-.56**	-.57**	-.02	-.14
12W	-.58**	-.64**	-.36	-.62**	-.67**	-.65**	-.41	-.50*	-.27	-.38
QIDS										
B1	-.55*	-.45	-.38	-.32	-.58**	-.77***	-.56**	-.32	-.10	-.15
12W	-.51*	-.54*	-.22	-.47	-.65**	-.75***	-.38	-.35	-.23	-.30

Note. B1: Baseline; 12W: 12-weeks.

CDRS-R: Children's Depression Rating Scale, Revised; QIDS: Quick Inventory of Depressive Symptomatology, Self-Report; CASAFS: Child and Adolescent Social and Adaptive Functioning Scale; CASAFS-PR: Peer relationships subscale; CASAFS-FR: Family relationships subscale; CASAFS-AP: Academic performance subscale; CASAFS-HS: Home duties/self care subscale.

* $p < .1$; ** $p < .05$; *** $p < .01$.

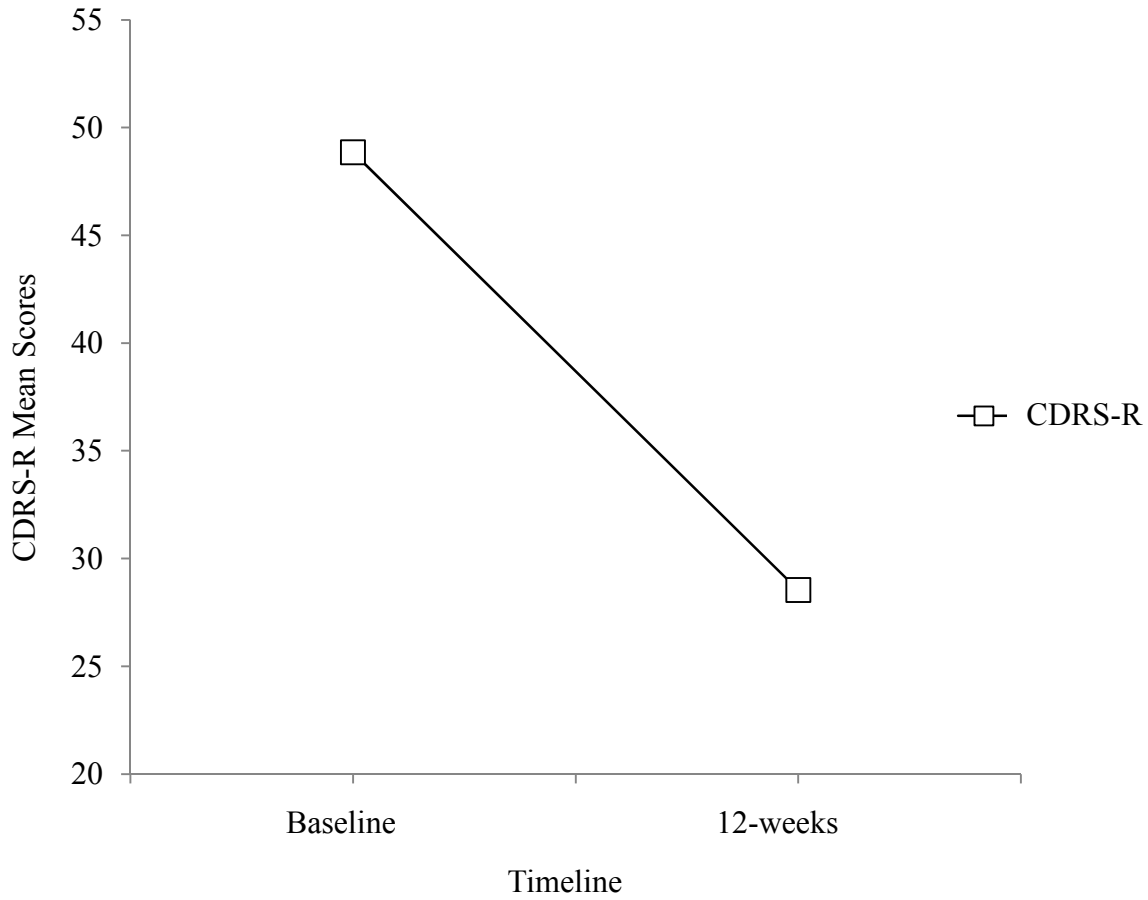


Figure 1. Children’s Depression Rating Scale, Revised (CDRS-R) mean scores at baseline and at 12-weeks.

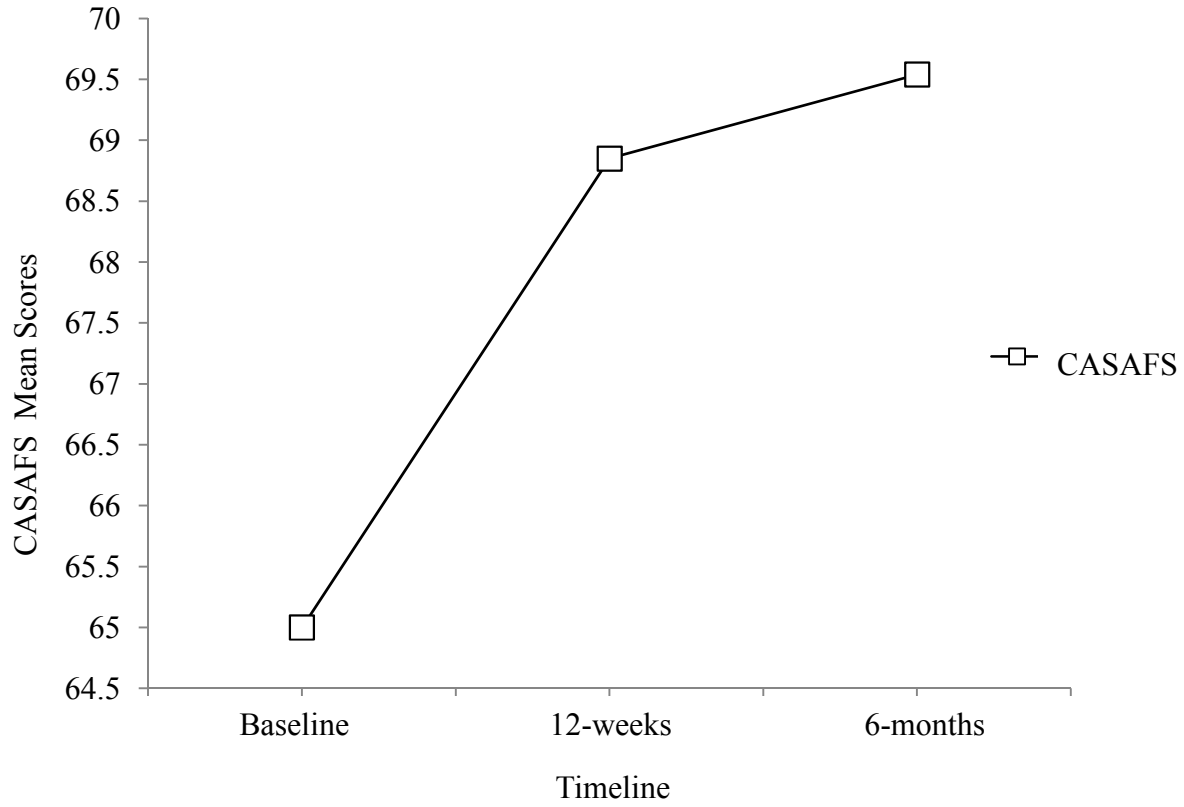


Figure 2. Child and Adolescent Social and Adaptive Functioning Scale (CASAFS) mean scores at baseline, 12-weeks, and 6-months.

Appendix A

CHILDREN'S DEPRESSION RATING SCALE, REVISED (CDRS-R)

Administration Booklet

by Elva O. Poznanski, M.D., and Hartmut B. Mokros, Ph.D.

Published by
WESTERN PSYCHOLOGICAL SERVICES
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Child's Name: _____ ID: _____

Age: _____ Gender: M F Ethnicity: _____ Date of Interview: _____

Examiner: _____

Interviewee: Child Mother Father Other (specify): _____

Note: The remainder of this summary page should be completed only if this Administration Booklet has been used to rate the child's CDRS-R interview. (See the instructions at the bottom of the last page of this booklet.)

CDRS-R Raw Summary Score _____

CDRS-R T-Score _____

Post-intervention

Percentile	2	10	20	30	40	50	60	70	80	90	95	99		
Raw Score	17	20	23	26	30	33	36	40	44	48	50	60	70	77-113
T-Score	30	33	35	38	41	44	47	50	53	56	58	60	65	75

Interpretation of the CDRS-R T-Score

<input checked="" type="checkbox"/>	T-Score Range	Interpretation
	39 or lower	Scores this low are extremely rare. Seek information from others, as such uncommonly low scores may be associated with pervasive denial.
	40-54	A depressive disorder is unlikely to be confirmed in further evaluation.
	55-64	It is possible that a depressive disorder might be confirmed in a comprehensive diagnostic evaluation. Further evaluation should be pursued if any of the following conditions are applicable: <ul style="list-style-type: none"> Moderate to severe ratings were made in any symptom areas The rating for Suicidal Ideation is 3 or above A chronic course (i.e., more than one year) is described for a clinically significant indicator of depressive mood (i.e., Difficulty Having Fun, Depressed Feelings, Depressed Facial Affect, or Irritability)
	65-74	A depressive disorder is likely to be confirmed in a comprehensive diagnostic evaluation. Further evaluation should be pursued.
	75-84	A depressive disorder is very likely to be confirmed. Further evaluation should be pursued.
	85 or higher	A depressive disorder is almost certain to be confirmed. Intervene and evaluate immediately.

Comparison of Symptom Ratings from All Sources

Evaluated Symptom Area	Rating Source												Best Description of Child							
	Child			Parent			Other													
Impaired Schoolwork	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Difficulty Having Fun	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Social Withdrawal	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Sleep Disturbance	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Appetite Disturbance	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Excessive Fatigue	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Physical Complaints	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Irritability	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Excessive Guilt	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Low Self-Esteem	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Depressed Feelings	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Morbid Ideation	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Suicidal Ideation	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Excessive Weeping	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Ratings of Observed Nonverbal Behavior																				
Depressed Facial Affect	1	2	3	4									1	2	3	4	1	2	3	4
Listless Speech	1	2	3	4									1	2	3	4	1	2	3	4
Hypoactivity	1	2	3	4									1	2	3	4	1	2	3	4

= No apparent difficulties
 = Clinically significant difficulties
 = Severe clinically significant difficulties

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W-242A

Instructions: Rate each symptom area for this child by writing only one number in the box.
Write *NR* ("Not Rated") in the box if there is insufficient information to derive a rating.

- 1. IMPAIRED SCHOOLWORK** →
- Performance is consistent with ability 1
 - Decrease in school performance and/or ability to concentrate 2
 - Major interference with performance in most subjects 3
 - No motivation to perform 4

Comment _____

- 2. DIFFICULTY HAVING FUN** →
- Interest and activities realistically appropriate for age, personality, and social environment. No appreciable change from usual behavior during at least the past 2 weeks. Any feelings of boredom are seen as transient. 1
 - Describes some activities as enjoyable that are realistically available several times a week but not on a daily basis. 2
 - Shows interest but not enthusiasm. 3
 - Is easily bored. Complains of "nothing to do" as characteristic of daily experience. Participates in structured activities with a "going through the motions" attitude. 4
 - May express interest primarily in activities that are (realistically) unavailable on a daily or weekly basis. 5
 - Has no initiative to become involved in any activities. Describes himself/herself as primarily passive. Watches others play or watches TV but shows little interest. Requires coaxing and/or pushing to get involved in activity. Shows no enthusiasm or real interest. Has difficulty naming activities. 6

Comment _____

- 3. SOCIAL WITHDRAWAL** →
- Enjoys friendships with peers at school and at home 1
 - Does not actively seek out friendships but waits instead for others to initiate a relationship. Occasionally rejects opportunities to play, without having a describable alternative. 2
 - Frequently avoids or refuses opportunities for desirable interaction with others and/or sets up situations where rejection is inevitable. 3
 - Does not currently relate to other children. States that he/she has "no friends" or actively rejects new or former friends. 4

Comment _____

- 4. SLEEP DISTURBANCE** →
- No difficulty or occasional difficulty that is situationally explainable 1
 - Frequently has mild difficulty with sleep 2
 - Has difficulty with sleep nearly every night 3

Supplemental information (not scored)
 Indicate when sleep disturbance occurs (check all applicable items):

- Upon first going to bed
- In the middle of the night
- Early in the morning

Comment _____

- 5. APPETITE DISTURBANCE** →
- No problems or changes in eating pattern 1
 - Mild but notable change from usual eating habits 2
 - Avoids eating and/or is not hungry most of the time OR describes a noteworthy increase in appetite and/or excessive food intake 3

Supplemental information (not scored)
 If applicable, indicate type of appetite disturbance:

- Increased appetite
- Decreased appetite

Comment _____

- 6. EXCESSIVE FATIGUE** →
- No unusual complaints of "feeling tired" during the day 1
 - Complaints of fatigue seem somewhat excessive and are not related to boredom or increased activity levels 2
 - Daily complaints of feeling tired 3
 - Complaints of feeling tired most of the day. May voluntarily take long naps without feeling refreshed. Degree of fatigue interferes with play activities. 4

Comment _____

Add all numbers in above boxes here: _____ (Subtotal 1)

7. PHYSICAL COMPLAINTS →

- Occasional complaints that do not appear to be excessive 1
- Complaints appear mildly excessive 2
- Complains daily of aches and pains. These occasionally interfere with his/her ability to function. 3
- Preoccupied with aches and pains. These regularly interfere with play activities. 4

Comment _____

8. IRRITABILITY →

- Rarely irritable 1
- Easily irritable. Periods of irritability occur several times a week, but do not last long. 2
- Frequently irritable. Extended periods of irritability occur several times a week and are difficult to break out of. 3
- Constant experience of irritability. Nothing changes this mood. 4

Comment _____

9. EXCESSIVE GUILT →

- Does not express any undue feeling of guilt. Reported guilt appears appropriate to precipitating event. 1
- Exaggerates guilt and/or shame out of proportion to the event described 2
- Feels guilty over things not under his/her control. These feelings interfere with everyday functioning. 3
- Severe delusions of guilt 4

Comment _____

10. LOW SELF-ESTEEM →

- Describes himself/herself in primarily positive terms 1
- Describes one important or prominent area where he/she feels there is a deficit 2
- Describes himself/herself in predominantly negative terms or gives bland answers to questions asked 3
- Refers to himself/herself in derogatory terms. Reports that other children frequently refer to him/her by using derogatory nicknames. Puts himself/herself down. 4

Comment _____

11. DEPRESSED FEELINGS →

- Occasional feelings of unhappiness that quickly disappear 1
- Describes sustained periods of unhappiness that appear excessive for events described 2
- Feels unhappy most of the time without a major precipitating cause 3
- Feels unhappy all of the time; characterized by a sense of psychic pain (e.g., "I can't stand it") 4

Comment _____

12. MORBID IDEATION →

- No morbid thinking reported 1
- Strongly denies morbid thoughts 2
- Discusses morbid thoughts that relate to a real event but seem excessive 3
- Describes preoccupation with morbid thoughts several times a week. These morbid thoughts extend beyond external reality. 4
- Preoccupied on a daily basis with death themes or morbid thoughts that are elaborate, extensive, or bizarre 5

Comment _____

13. SUICIDAL IDEATION →

- Understands the word *suicide*, but does not apply the term to himself/herself 1
- Sharp denial of suicidal thoughts 2
- Has thoughts about suicide, or of hurting himself/herself (if he/she does not understand the concept of suicide), usually when angry 3
- Has recurrent thoughts of suicide 4
- Has made a suicide attempt within the last month or is actively suicidal 5

Comment _____

14. EXCESSIVE WEeping →

- Report appears normal for age 1
- Suggestive statements that he/she cries, or feels like crying, more frequently than peers 2
- Cries more often than peers, occasionally without clear precipitant 3
- Cries or feels like crying frequently (several times a week). Admits to crying without knowing the reason why. 4
- Cries nearly every day 5

Comment _____

Add all numbers in above boxes here: _____ (Subtotal 2)

STOP if the interview was conducted with a parent (or another adult). No further scoring activity is justified or supported by empirical data. Refer to chapter 3 of the CDRS-R Manual for interpretive considerations.

CONTINUE if this interview was conducted with the child. For the three remaining symptom areas, rate the child based on his or her nonverbal characteristics during the interview.

15. DEPRESSED FACIAL AFFECT →

- Facial expression and voice animated during the interview. No sign of depressed affect. **1**
- Mild suppression of affect. Some loss of spontaneity. **2**
- Overall loss of spontaneity. Looks unhappy during parts of the interview (e.g., sullen face, lowered eyes, lack of animation in face). Is capable of smiling, however, and does not avoid eye contact when discussing nonthreatening areas. **3**
- Moderate restriction of affect throughout most of the interview. Has longer and frequent periods of looking distinctly unhappy. Nothing seems to enliven him/her. **4**
- Severe restriction of affect. Looks distinctly sad and withdrawn. Minimal verbal interaction throughout the interview. Cries or may appear tearful. **5**
- **6**

Comment _____

17. HYPOACTIVITY →

- Bodily movements are animated. (Note that a hyperactive, agitated child is not distinguished here from what would be seen as normal nondistracting behavior; hyperactivity should be noted.) **1**
- Bodily movements appear somewhat restricted and/or slowed **2**
- Definite restriction in bodily movements and an overall sense of motor retardation **3**
- Severe sense of motor retardation with catatonic-like qualities **4**
- **5**
- **6**
- **7**

Comment _____

16. LISTLESS SPEECH →

- Quality of speech seems situationally sensitive without any noteworthy deviations. **1**
- Slowed tempo, monotone, or overly soft speech. **2**
- Slowed tempo with many pauses where he/she appears to drift. Hesitations include sighing. Voice qualities are distinctly monotonic and unanimated, and convey a sense of distress and psychic discomfort. **3**
- Extreme sense of psychic distress exhibited in voice or by a profound sense of hollowness or emptiness. Has difficulty conducting the interview. **4**

Comment _____

Add all numbers in above boxes here: _____ (Subtotal 3)

Sum all the page subtotals to calculate the Raw Summary Score:

Subtotal 1	+	Subtotal 2	+	Subtotal 3	=	Raw Summary Score
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First, write the Raw Summary Score in the space labeled "CDRS-R Raw Summary Score" on the summary page (page 1) of this Administration Booklet. Locate the Summary Score on the middle line of the "scoring thermometer" on the same page. The T-score that corresponds to the Summary Score can be found directly below it, on the bottom line. Copy the T-score to the space labeled "CDRS-R T-Score." (The percentile that corresponds to the Summary Score can be found directly above it, on the top line of the scoring thermometer.)

Next, if you suspect any fabrication, denial, or similar validity problems, see chapter 3 of the CDRS-R Manual for interpretive considerations. Otherwise, in the middle of the summary page, locate the T-score range in which the child's T-score falls. Place a check mark in the column to the left of the appropriate T-score range to indicate the interpretive statement applicable to this child's T-score. Finally, proceed to the bottom portion of the same page and summarize the interview ratings for all informants.

Appendix B

Participant ID #: _____	Date: _____
Baseline	W1 W2 W3 W4 W5 W6 W7 W8 W9 W10 W11 W12

Quick Inventory of Depressive Symptomatology (Self-Report) (QIDS-SR₁₆)

Please circle the one response to each item that best describes you for the past seven days.

1. Falling Asleep:
 - 0 I never take longer than 30 minutes to fall asleep.
 - 1 I take at least 30 minutes to fall asleep, less than half the time.
 - 2 I take at least 30 minutes to fall asleep, more than half the time.
 - 3 I take more than 60 minutes to fall asleep, more than half the time.
2. Sleep During the Night:
 - 0 I do not wake up at night.
 - 1 I have a restless, light sleep with a few brief awakenings each night.
 - 2 I wake up at least once a night, but I go back to sleep easily.
 - 3 I awaken more than once a night and stay awake for 20 minutes or more, more than half the time.
3. Waking Up Too Early:
 - 0 Most of the time, I awaken no more than 30 minutes before I need to get up.
 - 1 More than half the time, I awaken more than 30 minutes before I need to get up.
 - 2 I almost always awaken at least one hour or so before I need to, but I go back to sleep eventually.
 - 3 I awaken at least one hour before I need to, and can't go back to sleep.
4. Sleeping Too Much:
 - 0 I sleep no longer than 7-8 hours/night, without napping during the day.
 - 1 I sleep no longer than 10 hours in a 24-hour period including naps.
 - 2 I sleep no longer than 12 hours in a 24-hour period including naps.
 - 3 I sleep longer than 12 hours in a 24-hour period including naps.
5. Feeling Sad:
 - 0 I do not feel sad.
 - 1 I feel sad less than half the time.
 - 2 I feel sad more than half the time.
 - 3 I feel sad nearly all of the time.
6. Decreased Appetite:
 - 0 There is no change in my usual appetite.
 - 1 I eat somewhat less often or lesser amounts of food than usual.
 - 2 I eat much less than usual and only with personal effort.
 - 3 I rarely eat within a 24-hour period, and only with extreme personal effort or when others persuade me to eat.
7. Increased Appetite:
 - 0 There is no change from my usual appetite
 - 1 I feel a need to eat more frequently than usual.
 - 2 I regularly eat more often and/or greater amounts of food than usual.
 - 3 I feel driven to overeat both at mealtime and between meals.
8. Decreased Weight (Within the Last Two Weeks)
 - 0 I have not had a change in my weight.
 - 1 I feel as if I've had a slight weight loss.
 - 2 I have lost 2 pounds or more.
 - 3 I have lost 5 pounds or more.
9. Increased Weight (Within the Last Two Weeks)
 - 0 I have not had a change in my weight.
 - 1 I feel as if I've had a slight weight gain.
 - 2 I have gained 2 pounds or more.
 - 3 I have gained 5 pounds or more

Enter the highest score on any 1 of the 4 sleep items (1-4 above) _____

Enter the highest score on any 1 of the 4 appetite/weight change items (6-9 above) _____

Participant ID #:		Date:										
Baseline	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12

10. Concentration/Decision Making:
- 0 There is no change in my usual capacity to concentrate or make decisions.
 - 1 I occasionally feel indecisive or find that my attention wanders.
 - 2 Most of the time, I struggle to focus my attention or to make decisions.
 - 3 I cannot concentrate well enough to read or cannot make even minor decisions.
11. View of Myself:
- 0 I see myself as equally worthwhile and deserving as other people.
 - 1 I am more self-blaming than usual.
 - 2 I largely believe that I cause problems for others.
 - 3 I think almost constantly about major and minor defects in myself.
12. Thoughts of Death or Suicide:
- 0 I do not think of suicide or death.
 - 1 I feel that life is empty or wonder if it's worth living.
 - 2 I think of suicide or death several times a week for several minutes.
 - 3 I think of suicide or death several times a day in some detail, or I have made specific plans for suicide or have actually tried to take my life.
13. General Interest:
- 0 There is no change from usual in how interested I am in other people or activities.
 - 1 I notice that I am less interested in people or activities.
 - 2 I find I have interest in only one or two of my formerly pursued activities.
 - 3 I have virtually no interest in formerly pursued activities.

14. Energy Level:
- 0 There is no change in my usual level of energy.
 - 1 I get tired more easily than usual.
 - 2 I have to make a big effort to start or finish my usual daily activities (for example, shopping, housework, cooking or going to work).
 - 3 I really cannot carry out most of my usual daily activities because I just don't have the energy.
15. Feeling Slowed Down:
- 0 I think, speak, and move at my usual rate of speed.
 - 1 I find that my thinking is slowed down or my voice sounds dull or flat.
 - 2 It takes me several seconds to respond to most questions and I'm sure my thinking is slowed.
 - 3 I am often unable to respond to questions without extreme effort.
16. Feeling Restless:
- 0 I do not feel restless.
 - 1 I'm often fidgety, wringing my hands, or need to shift how I am sitting.
 - 2 I have impulses to move about and am quite restless.
 - 3 At times, I am unable to stay seated and need to pace around.

Enter the highest score on either of the 2 psychomotor (15-16 above) _____

Total Score: _____ (Range 0-27)

Appendix C

Participant ID# _____ Date _____
 Baseline _____ Week 6 _____ Week 12 _____

CADP
SOCIAL SCALE

Below is a list of items that describe people. Please **circle** the number for each item that **best** describes you. If the item '**NEVER**' describes you circle the '1', if it '**SOMETIMES**' describes you circle the '2', if it '**OFTEN**' describes you circle the '3' and if it '**ALWAYS**' describes you circle the '4'. Some of the family questions may not apply to everyone, so if this is the case for you, please circle the '**DOES NOT APPLY**' response.

	Never	Some-times	Often	Always	
1. I get good marks in Math/Arithmetic	1	2	3	4	
2. I go out to places with my friends	1	2	3	4	
3. I have a good relationship with my mother	1	2	3	4	Does Not Apply To Me
4. I help around the house	1	2	3	4	
5. I get good marks in Science	1	2	3	4	
6. I have friends of the opposite sex	1	2	3	4	
7. I have a good relationship with my father	1	2	3	4	Does Not Apply To Me
8. I keep my room and belongings tidy	1	2	3	4	
9. I get good marks in Social Science and/or History	1	2	3	4	
10. I go to parties or school dances	1	2	3	4	
11. I get on well with brother(s)/ sister(s) (if you have any)	1	2	3	4	Does Not Apply To Me
12. I keep my clothes clean and tidy	1	2	3	4	
13. I get good marks in reading/writing/English	1	2	3	4	
14. I have at least one or two special friends	1	2	3	4	

PLEASE TURN THE PAGE TO ANSWER MORE QUESTIONS

	Never	Some-times	Often	Always
15. I get on well with my relatives	1	2	3	4
16. I shower and keep myself clean	1	2	3	4
17. I have trouble with my school work	1	2	3	4
18. I spend most of my spare time alone	1	2	3	4
19. I have fights with my parent(s)	1	2	3	4
20. I help with the cooking at home	1	2	3	4
21. I am successful at my school work	1	2	3	4
22. I have difficulty making friends	1	2	3	4
23. I have an adult who I can talk to if I have a problem	1	2	3	4
24. I help with the clearing up after meals	1	2	3	4

PLEASE CHECK THAT YOU HAVE ANSWERED EACH QUESTION

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE

Side Two Directions

Listed below are a number of sentences about thoughts that people sometimes have. Please *indicate which of these thoughts you have had in the past month*. Fill in the circle under the answer that best describes your own thoughts. Be sure to fill in a circle for each sentence. Remember, *there are no right or wrong answers*.

This thought was in my mind:	Almost every day.	Couple of times a week.	About once a week.	Couple of times a month.	About once a month.	I had this thought before but not in the past month.	I never had this thought.
1. I thought it would be better if I was not alive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I thought about killing myself.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I thought about how I would kill myself.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I thought about when I would kill myself.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I thought about people dying.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I thought about death.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I thought about what to write in a suicide note	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I thought about writing a will	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. I thought about telling people I plan to kill myself.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. I thought about how people would feel if I killed myself.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. I wished I were dead	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. I thought that killing myself would solve my problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. I thought that others would be happier if I was dead	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. I wished that I had never been born	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. I thought that no one cared if I lived or died.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

TS	
TOTAL %	
_____ %	

CI	

Appendix E

Screening ___ Baseline ___ 6 weeks ___ 12 weeks ___ 1 year ___

Participant # _____

Date _____

Physical Activity Questionnaire

Sex: M _____ F _____ Age: _____ Grade: _____

We are trying to find out about your level of physical activity from *the last 7 days* (in the last week). This includes sports or dance that make you sweat or make your legs feel tired, or games that make you breathe hard, like tag, skipping, running, climbing, and others.

Remember:

1. There are no right and wrong answers — this is not a test.
2. Please answer all the questions as honestly and accurately as you can — this is very important.

1. Physical activity in your spare time: Have you done any of the following activities in the past 7 days (last week)? If yes, how many times? (Mark only one circle per row.)

	No	1-2	3-4	5-6	7 times or more
Walking, running or jogging.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Working out or aerobics.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Skateboarding/In-line skating.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ice hockey or field hockey.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Swimming or water polo.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bicycling.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Football or soccer.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Basketball or lacrosse.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Baseball or softball.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. In the last 7 days, during your physical education (PE) classes, how often were you very active (playing hard, running, jumping, throwing, lifting weights)? (Check one only.)

- I don't do PE
- Hardly ever
- Sometimes
- Quite often
- Always

3. In the last 7 days, what did you normally do *with your free time during the school day*? (Check one only.)

- Sat down (talking, reading, doing schoolwork).....
- Stood around or walked around
- Worked out, ran or was physically active a little bit
- Worked out, ran or was physically active quite a bit.....
- Worked out, ran or was physically active most of the time.....

OVER

4. In the last 7 days, on how many days *right after school*, did you do sports, exercise, dance, or play games in which you were very active? (Check one only.)

- None
- 1 time last week
- 2 or 3 times last week
- 4 times last week
- 5 times last week

5. In the last 7 days, on how many *evenings* did you do sports, exercise, dance, or play games in which you were very active? (Check one only.)

- None
- 1 time last week
- 2 or 3 times last week
- 4 or 5 last week
- 6 or 7 times last week

6. *On the last weekend*, how many times did you do sports, exercise, dance, or play games in which you were very active? (Check one only.)

- None
- 1 time
- 2 — 3 times
- 4 — 5 times
- 6 or more times

7. Which *one* of the following describes you best for the last 7 days? Read *all five* statements before deciding on the *one* answer that describes you.

- A. All or most of my free time was spent doing things that involve little physical effort
- B. I sometimes (1 — 2 times last week) did physical things in my free time (e.g. played sports, went running, swimming, bike riding, did aerobics)
- C. I often (3 — 4 times last week) did physical things in my free time
- D. I quite often (5 — 6 times last week) did physical things in my free time
- E. I very often (7 or more times last week) did physical things in my free time...

8. Were you sick last week, or did anything prevent you from doing your normal physical activities? (Check one.)

- Yes
- No

If Yes, what prevented you? _____