Mindfulness Training for Adolescents with Learning Disabilities

by

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A thesis submitted in conformity with the requirements
for the degree of Master of Arts

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2010

The current study evaluated the impact of a 20-week mindfulness training program on executive function, internalizing and externalizing behaviour, and social skills in a clinical sample of adolescent boys with learning disabilities (LD). Mindfulness Martial Arts (MMA) is a manualized group treatment program incorporating elements of mindfulness meditation, cognitive behavioural therapy, and mixed martial arts. Sixty-five boys (ages 12 – 18) with LD were assigned to the MMA or waitlist control group (WL). Adolescents and their parents completed standardized questionnaires before and after training. Analysis of adolescents with distinct clinical profiles showed promising effects. Compared to the WL group, MMA participants with co-occurring ADHD improved on parent-rated externalizing behaviour, oppositional defiant problems, and conduct problems. Boys with elevated hyperactive/impulsive symptomotology improved on parent-rated social problems and monitoring skills. Boys with elevated anxiety reported decreased anxiety. MMA shows promise as an alternative treatment option for youth with LD and co-occurring difficulties.

Acknowledgments

This study would not have been possible without the financial support of the Social Sciences and Humanities Research Council of Canada and the Government of Ontario. I would like to thank Paul Badali, the Mindfulness Martial Arts program developer, and Integra Foundation for pioneering such an innovative and exciting program, and for allowing me to be a part of it. I am indebted to the wonderful staff of Integra, whose patience, optimism and creativity were unfailing. I would also like to acknowledge Judith Wiener and Joe Ducharme for designing the research project. Their expertise, guidance and support were invaluable. Many thanks go out to the research team for their hours of phone calling, database design, data collection and data entry, especially Daniella Biondic, Amy Hsu, Angela Varma, Natalie Muradian and Changkeun (Trevor) Lee. Finally, I'd like to thank all of the participants whose energy and humour inspired me.

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1 Introduction

Learning Disabilities (LD) are neurobiological disorders affecting the ability to acquire, organize, retain, understand and use information (Learning Disabilities Association of Canada, 2005). Although the impact of LD is primarily in the academic domain, youth with LD also experience social difficulties and psychological disturbance (Capozzi et. al., 2008; Willcutt & Pennington, 2000). Attention-Deficit/Hyperactivity Disorder (ADHD), characterized by cognitive impairments and developmentally inappropriate or excessive behaviour (Barkley, 2006), frequently co-occurs with LD. Comorbidity estimates range from 20-60%, with much of the variability attributable to the definitions of LD and ADHD used to define the sample (Maynard, Tyler & Arnold, 1999; Willcutt, Pennington, Olson & DeFries, 2007). Although it is generally accepted that LD and ADHD are distinct disorders, research suggests that a common deficit in executive functioning explains the high degree of overlap (Seidman, Biederman, Monuteaux, Doyle & Faraone, 2001; Willcutt, Pennington, Olson, Chhabildas & Hulslander, 2005). Executive function (EF) refers to the set of cognitive processes that control goal-directed behaviour. These processes include goal setting, organization of behaviour, response inhibition, cognitive flexibility, working memory, attention and progress-monitoring (Denckla, 2007; Pasini, 2007). Students with LD and ADHD often exhibit impairment in one or more of these processes (Barkley, 2006; D'Amico & Passolunghi, 2009; Harris, Reid, & Graham, 2004; Lazar & Frank, 1998; Seidman et. al., 2001).

Difficulties with inhibitory control have been observed in students with ADHD and language-based LD (Barkley, 2006; Berlin, Bohlin, Nyberg & Janals, 2004; Denckla, 2007; Pasini et. al., 2007). At school, poor response inhibition can manifest in calling out answers, seeming disregard for teacher directives, excessive motor movements and disruptive behaviour, and intrusions or omissions in schoolwork. In social interactions, difficulty inhibiting a prepotent response can result in excessive talking, interruptions, minimal turn taking, and inappropriate or off-topic comments. Students with LD and ADHD also have difficulty solving problems. They exhibit poor strategy generation, selection and implementation, and difficulties monitoring progress, which can lead to off-task behaviour and decreased accuracy in academic work (Harris, Reid, & Graham, 2004; Shallice et. al., 2002). Inattention is a core deficit of ADHD (for an

overview see Barkley, 2006), but there is also evidence that students with LD have difficulty with selective attention and sustained attention (Garcia, Pereira & Fukuda, 2007; Lazar & Frank, 1998).

Students with LD and ADHD experience considerable functional impairment. Deficits in social functioning and friendship formation have been documented in both populations (Coleman, 2008; Harris, Reid & Graham, 2004; Kavale & Forness, 1996; Vaughn, Sinagub & Kim, 2004). Students with LD are more likely to be rejected and neglected by their peers (Wiener, Harris & Shirer, 1990) and have less stable friendships than their classmates without LD (Wiener & Schneider, 2002). Interventions designed to teach social skills have limited efficacy (Kavale & Forness, 1996). Adolescents with LD and ADHD are more likely to experience mental health difficulties, including anxiety, depression and substance abuse (Beitchman et. al., 2001; Elia, Ambrosini & Berrettini, 2008; Jarrett & Ollendick, 2008; Treuting & Hinshaw, 2001). Psychosocial or pharmacological treatments aimed at improving the problems associated with LD and ADHD are often viewed as stigmatizing for adolescents (Mishna & Muskat, 2004), and medication is associated with negative side effects for some youth (Faraone, Biederman, Morley & Spencer, 2008; Graham & Coghill, 2008). As such, alternative interventions targeting underlying EF deficits may be helpful for addressing the behavioural and social difficulties experienced by youth with LD and ADHD. The aim of the current study was to investigate whether mindfulness meditation training improves executive functioning, social functioning, and psychological well-being in a clinical sample of youth with LD and co-occurring difficulties. Mindfulness meditation improves self-observation, self-control, and attention, and has demonstrated clinical utility for a variety of populations (Baer, 2003).

1.1 Mindfulness Meditation

Mindfulness is the non-evaluative, present-centred awareness that results from the deliberate focusing and refocusing of attention on sensations, thoughts and feelings as they arise on a moment-by-moment basis (Williams, Teasdale, Segal, & Kabat-Zinn, 2007; Ortner, Kilner & Zelazo; 2007; Semple, Reid & Miller, 2005; Zylowska et.al., 2008). Bishop et. al. (2004) propose an operational definition of mindfulness consisting of two components: self-regulation of attention and a curious and accepting attitude towards experience. Mindfulness can be conceptualized as both an enduring disposition and a fluctuating state. State levels of

mindfulness can be enhanced through a variety of informal and formal meditative practices, such as sitting meditation (Miners, 2008).

Mindfulness is believed to enhance psychological well-being through the processes of decentering, acceptance, exposure, and self-regulation (Allen, 2006; Baer, 2003; Bishop et. al., 2004; Chambers, Lo & Allen, 2008; Hayes & Feldman, 2004; Hooker & Fodor, 2008; Thompson & Gauntlett-Gilbert, 2008). Detached observation of internal experience allows one to monitor the content of thoughts without judgment or self-censorship. Thoughts are viewed as passing mental events reflecting the impermanent nature of being. Thoughts and feelings are not labeled as "good" or "bad," nor are they actively sought or avoided. This attitude of acceptance and openness to experience allows previously suppressed thoughts to enter the field of awareness. It has been hypothesized that repeated exposure to stressful thoughts leads to desensitization and reduced emotional reactivity. As a result, experiential avoidance, which may be associated with some forms of psychopathology (Chawla & Ostafin, 2007), may be reduced. Constant monitoring and regulation of cognitive processes reduces the tendency to act on "auto-pilot." Detached self-observation allows one to recognize problematic situations before they escalate and weigh potential coping strategies without reverting to habitual patterns of response. In this way, impulsivity is reduced. This self-regulation of attention, cognition and emotion is also known as metacognition or executive control.

A growing body of evidence supports the use of mindfulness meditation as a complementary or alternative treatment for a variety of health and mental health issues. Baer's (2003) empirical review reported that mindfulness-based programs are moderately effective treatments for chronic pain, binge-eating, anxiety and depression in adults, with an overall mean effect size of 0.59. Subsequent research with clinical and non-referred adults suggests that mindfulness enhances emotional regulation (Ornter, Kilner & Zelazo, 2007) and improves social interaction, specifically in the areas of romantic relationship satisfaction, conflict resolution, empathy, and reactions to perceived social rejection (Brown, Ryan & Creswell, 2007). Mindfulness training also improves attention-related processes, such as sustained attention (Chambers, Lo & Allen, 2008), alerting and orienting (Jha, Krompinger & Baime, 2007). Mindfulness has been incorporated into several manualized treatment programs, such as Mindfulness Based Cognitive Therapy (MBCT; Ma & Teasdale, 2004;Teasdale et. al., 2000) for depression relapse prevention; Mindfulness Based Stress Reduction (MBSR; Kabat-Zinn, Massion, Kristeller, & Peterson,

1992) for chronic pain and stress-related disorders; Dialectical Behavior Therapy (DBT; Koerner & Linehan, 2000) for bipolar personality disorder; and Acceptance and Commitment Therapy (ACT; Hayes, Luoma, Bond, Masuda & Lillis, 2005).

Although the clinical applications of mindfulness for children and adolescents are still under investigation, a review of existing literature indicates that youth may benefit from mindfulness training in ways similar to adults. There has been some discussion regarding whether children possess the cognitive capacity to be truly mindful, with proponents arguing that children as young as 7 possess enough self-awareness to engage in modified mindfulness programs (Thompson and Gauntlett-Gilbert, 2008). Miners (2007) demonstrated that children as young as 9 demonstrate the capacity to think and behave mindfully without formal training. In an exploratory study of 114 youth ages 9-13, Miners established that youth possess varying levels of trait mindfulness prior to meditation. Trait mindfulness was negatively correlated with perceived stress, anxiety and depression, and positively correlated with friendship extensivity, but was not associated with age. Bogels, Hoogstad, van Dun, de Schutter, & Restifo (2008) demonstrated that an eight-week MBCT program significantly increased levels of mindfulness in adolescents ages 11-17, suggesting that youth not only have the cognitive potential to grasp the core tenets of mindfulness meditation, but that they are able to enhance their baseline levels of mindfulness through formal training.

Mindfulness training improves attention, executive control and psychological well-being in children and adolescents. Results of randomized control studies of mindfulness awareness practices (MAPs) with pre-kindergarten and early elementary school students found that children aged 4-9 demonstrated improved executive functioning as rated by parents and teachers after 8 weeks of training. Four to five year old children demonstrated improved working memory, planning and organization (Flook, Smalley, Galla, Kitil, Kaiser-Greenland, n.d.) and seven to nine year olds made improvements in behavioural regulation and metacognition, with greater effects among those who displayed executive dysfunction prior to the study (Flook, Smalley, Kitil, et. al, n.d.).

In samples of clinic-referred adolescents with ADHD and externalizing disorders, eight weeks of mindfulness training resulted in significant improvements on objective tests of executive functions, including sustained attention (Bogels et. al., 2008), conflict orienting, and set-shifting

(Zylowska et.al., 2008). Results of the latter study should be considered preliminary, as they are based on a mixed sample of adults and adolescents, and there was no control group. Mindfulness-based programs also reduce problematic behaviour associated with ADHD and other externalizing disorders. Following a combined parent and child MBCT course, parents of 11-to-17 year-olds reported significant improvements in their children's self-control, quality of life and goal attainment, and adolescent self-reports indicated significant reductions of internalizing and externalizing problems compared to a wait-list control group. Further, the percentage of adolescents who fell within the normal range on a standardized parent-report of psycho-social adjustment increased from 25% to 42% following the program. It should be noted, however, that the dropout rate was very high, with only seven families attending all eight weeks of training (Bogels et. al., 2008).

Research with non-clinical populations suggests that mindfulness training also has the potential to alleviate anxiety symptoms in young children and adolescents. Compared to a control group and a guidance group, 3rd graders participating in an 18 week meditation course showed significant improvement in self-reported test anxiety (Linden, 1973). A feasibility study with 7-8 year olds nominated by teachers as anxious showed a trend towards reductions in anxious behaviour and improved adaptive functioning following six weeks of mindfulness training, although the small sample size precluded statistical analyses. Since no control group was used, it is unclear whether behaviour changes were due to intervention effects (Semple, Reid & Miller, 2005). A review of research on sitting meditation with youth reported that, in addition to ameliorating subjective report of anxiety, meditation also reduced physiological markers of stress such as blood pressure and heart rate (Black, Milam & Sussman, 2009). A randomized control trial showed that three months of daily meditation significantly reduced resting and ambulatory blood pressure and heart rate in 7th graders (Barnes, Davis, Murzynowski & Treiber, 2004). The promising results emerging from initial research with children and adolescents, combined with the well-established and ever-growing body of research with adults, suggests that mindfulness-based therapies have the potential to improve EF and psychological well-being in clinical populations of all ages.

1.2 Objective and Hypotheses

The current study investigates whether mindfulness training is an effective intervention for adolescents with LD and co-occurring ADHD and anxiety symptomotology. A pre-test, post-test, follow-up intervention-waitlist control design was used to determine whether 20 weeks of mindfulness-based cognitive therapy and martial arts training improves EF and decreases internalizing and externalizing problem behaviours and social problems in a mixed clinical sample of 12-18 year-old boys. It was hypothesized that participants enrolled in the Mindfulness Martial Arts (MMA) program will demonstrate significant improvements in executive functioning at post-test compared to the waitlist control (WL) group. Specifically, parent ratings will show enhanced behavioural regulation, characterized by inhibitory control, cognitive flexibility, and emotional control. Behavioural and emotional regulation is negatively correlated with parent-reported behavioural problems (Eisenberg et. al., 1997). As a result, the MMA group was expected to exhibit a significantly greater reduction in externalizing problems than the WL group from pre-test to post-test. Since early externalizing behaviour is associated with later peer victimization (Schwartz, McFayden-Ketchum, Dodge, Pettit & Bates, 1999), and higher levels of regulation are predictive of greater social competence (Eisenberg et. al., 1997), it was hypothesized that the MMA group will report a greater reduction in social problems than the WL group from pre-test to post-test. Previous research has established mindfulness as an effective treatment for anxiety and recurrent depression in adults, and preliminary research indicates that mindfulness training reduces anxiety in children. As such, it was hypothesized that adolescents receiving MMA will exhibit a greater reduction in internalizing problems than the WL group from pre-test to post-test. After completing the training, MMA participants were expected to exhibit significantly higher levels of mindfulness than they did at pre-test. Finally, it was hypothesized that gains will be maintained three months after the completion of the MMA program (at follow-up).

Due to the heterogeneity in EF, behaviour problems and social problems of the sample, exploratory subgroup analyses were conducted to determine whether participants with co-occurring behavioural or emotional difficulties respond to mindfulness training differentially. It was hypothesized that improvements will be evident in the domains that were of clinical concern at pre-test. That is, adolescents with ADHD symptomotology will show the greatest improvements in behavioural regulation (a component of EF), externalizing behaviour and social

skills, and those with anxiety symptomotology will exhibit improvements in internalizing behaviour.

2 Method

2.1 Participants

Adolescents who were clients of Integra, a children's mental health centre serving youth with LD in the City of Toronto, participated in the study. Eligible participants were boys between the ages of 12-18, had been previously diagnosed with LD, and were currently enrolled in or on the waitlist (WL) for the Mindfulness Martial Arts (MMA) program being offered at the agency.

Cognitive and academic testing was conducted to confirm the diagnosis of LD. To be included in the current study, participants had to obtain an IQ estimate of at least 80 on the Wechsler Abbreviated Scale of Intelligence and meet one of the following criteria: a) a standard score below 90 on at least one of the core reading, written language, and mathematics subtests of the Woodcock-Johnson Tests of Achievement; b) academic achievement at least one standard deviation (15 standard scores) below the IQ; or c) a previous diagnosis from a psychologist of non-verbal learning disability. A total of 78 adolescents (39 MMA and 39 WL) were initially enrolled in the study. Five were excluded for having an IQ estimate below 80, 5 did not meet the achievement criteria, and a further 3 withdrew from the study, leaving a final sample of 65 youth (33 MMA and 32 WL). The final sample comprised 49 participants (21 MMA, 28 WL) who had at least one achievement standard score below 90; 11 (7 MMA, 4 WL) classified on the basis of IQ/achievement discrepancy; and 5 (5 MMA, 0 WL) with a previous diagnosis of non-verbal LD.

Participants ranged in age from 12 - 18 years (total sample M=13.84, SD=1.33; MMA M=13.63, SD=1.51; WL M=14.06, SD=1.09). Approximately 45% (n=29; 15 MMA, 14 WL) reported a previous diagnosis of ADHD; 12% (n=8; 5 MMA, 3 WL) a previous diagnosis of anxiety disorder; 3% (n=2 MMA) a previous diagnosis of a mood disorder; 2% (n=1 MMA) a previous diagnosis of oppositional defiant disorder; and 2% (n=1 MMA) a previous diagnosis of conduct disorder. Approximately 46% (n=30; 17 MMA, 13 WL) of participants reported taking psychostimulant medication for ADHD symptoms when they enrolled in the study. Of the WL participants, three attended a specialized camp for children with LD and one obtained brief

counseling service at the agency. No other WL participants received treatment at the agency while participating in the study. A two-way contingency table analysis was conducted to evaluate whether the MMA and WL groups differed on demographic variables at Time 1 (pre-test). The groups did not differ on ADHD diagnosis (Pearson χ^2 = .00, p=.99), medication status (Pearson χ^2 = .42, p=.52), maternal employment status (Pearson χ^2 = 6.59, p=.09), paternal employment status (Pearson χ^2 = 2.32, p=.31), maternal psychological conditions (Pearson χ^2 = 2.12, p=.14), or paternal psychological conditions (Pearson χ^2 = .02, p=.89). Independent samples t-tests revealed no significant differences in age (F(1,63) = 2.41, p=.19), paternal education (F(1,49)=.007, p=.17), or maternal education (F(1,59)=.46, p=.07).

2.2 Attrition

Participation in the research was not a mandatory component of the MMA treatment program. For this reason, attrition rates in the current study do not reflect program retention. Only three participants withdrew from the research prior to post-testing (1 MMA, 2 control), two of whom continued to participate in MMA, for an attrition rate of 4.6%. Three-month follow-up data was only collected from MMA participants. Of those youth, eight could not be reached for follow-up testing, for an attrition rate of 24%.

2.3 Mindfulness Martial Arts Program Description

MMA is a manualized program (Badali, 2007) designed to decrease problematic behaviour and increase self-awareness, self-control, adaptability, social skills and self-defense skills in adolescents. The 20-week program is comprised of weekly 1.5-hour sessions combining elements of mindfulness, cognitive-behavioural therapy (CBT), and mixed martial arts. The core components of the program are conceptually linked by the overarching theme of Bushido, or Way of the Warrior. Bushido, a Japanese tradition of meditation and combat arts, is based on the philosophy that fear is conquered through self-examination and self-knowledge (Cleary, 2005). MMA participants are challenged to explore their inner world and accept their thoughts and feelings without judgment.

The key mindfulness concepts emphasized in the MMA program are impermanence, non-judgment, acceptance, letting go and focusing on the moment. Students are guided through body scans, sitting meditation, walking meditation, and mindful activities. The length of formal

meditation is gradually increased each week. Early sessions use concentrative “one-pointed” meditations to improve self-regulation of attention. During these meditations, students use a mantra as a focal point, and they are instructed to return to the mantra whenever their mind wanders. Once students have mastered concentrative meditation, they are introduced to receptive meditation in which there is no specific object of attention. In this form of mindfulness meditation, the individual is open to all experiences that may arise during the meditation.

The CBT element of the program consists of learning to name thoughts, feelings and body sensations; interpreting thoughts and feelings in the self and in others; using coping self-talk; recognizing self-defeating thinking; and understanding how thoughts and feelings affect interpersonal relationships. During each session, participants work on basic mixed martial arts techniques, including punching, kicking, falling, grappling and sparring.

The core mindfulness, CBT and martial arts components are incorporated into each session and connected by a unifying concept. For example, the concept of *no lingering* introduced in Week 13 is related to mindfulness (observing thoughts as passing events), CBT (reducing rumination), and martial arts (responding quickly when sparring). Concepts and skills are introduced gradually through didactic teaching, modeling, role-playing and scaffolding by the therapist instructor. Instructors tailor the length, depth and style of instruction based on the needs of each group.

In addition to the program goals, adolescents select personal goals to work towards. Progress is monitored by weekly practice logs and individual meetings with youth, parents and the therapist instructor. Progress towards goals, practice at home, effort, pro-social behaviour during sessions, and indications of improvement in any of the core components of the program are rewarded by points. When students reach predetermined point levels, they are promoted to the next belt level (white stripes or yellow belt). Student achievements are recognized in Weeks 5, 10, 15 and 20 of the program.

Both MMA instructors are Child and Family Therapists at Integra with Master’s degrees in social work. They hold advanced belts in martial arts, and they are experienced practitioners of mindfulness meditation. MMA was implemented solely by the program developer until the fall of 2008, at which time a second therapist was trained to lead additional groups. All but one of the MMA groups involved in the current study were led by the original therapist.

2.4 Design

Due to ethical and practical considerations, a waitlist control design was used instead of random assignment. Since most families wait at least a year to access treatment programs at Integra, it would be unethical to further delay entry into the program. Additionally, youth with severe behavioural or emotional difficulties may advance to the top of the waitlist at the discretion of Integra staff. Denying entry into the MMA program may be harmful to such clients.

Five phases of data were collected over a period of 2.5 years in order to garner a sufficient sample size. Each phase consisted of an MMA group of approximately 8 participants and a WL group of approximately 8 participants. Two MMA groups were offered during phase 5 because an additional instructor was trained. The following number of participants from each phase met criteria for inclusion in the current study: 7 MMA and 7 WL participants from phase 1; 6 MMA and 7 WL participants from phase 2; 5 MMA and 6 WL participants from phase 3; 4 MMA and 5 WL participants from phase 4, and 11 MMA and 7 WL participants from phase 5. Data were collected in four sessions: Pre-test, during Week 1 of the MMA program; post-test, during Week 20 of the MMA program; follow-up, three months after completion of the MMA program; and a cognitive and academic assessment conducted any time between Weeks 1-20. Parents and adolescents in the MMA group participated in all four data collection sessions. The WL group did not attend data collection at follow-up.

2.5 Procedures

The current study was approved by the University of Toronto's Research Ethics Board and Integra's internal ethical review. Prior to beginning the MMA program, adolescents and their parents attended an information session conducted by the program's developer and lead instructor. The goals, expectations and potential risks and benefits of the MMA program were explained in detail. The research program, including purpose, time commitment, and reimbursement, was also explained. Families who elected not to participate in the research were still eligible for the intervention. Parents who agreed to participate were given a package containing an information letter and consent form (see Appendix), a demographics questionnaire, and standardized questionnaires. Adolescents who gave verbal assent filled out questionnaires as a group, supervised by research assistants. Adolescents were told that they could skip items or

withdraw from the study without penalty. Adolescents who endorsed suicide items on any of the questionnaires were referred to a child and youth therapist for a suicide risk assessment.

Control participants were recruited from the MMA waitlist. A research assistant contacted parents by phone and explained the purpose of the study, requirements and reimbursement. Once verbal parental consent was obtained, families were scheduled in the same time intervals as treatment participants. The study was explained to adolescents and verbal assent was obtained on the first day of data collection, prior to administering the measures. WL control participants were offered admission into the MMA program after completing all phases of the research. Adolescents in the WL control group received either $20 per research session or a certificate for community service hours (a requirement of the Ontario Secondary School Diploma). Participants in the MMA group were only reimbursed for the academic assessment.

2.6 Measures Used to Describe and Define the Sample

2.6.1 Demographics questionnaire.

The demographics questionnaire contained questions pertaining to the child's health history, parental health history, parental education and employment status, and family composition.

2.6.2 Wechsler Abbreviated Scale of Intelligence (WASI).

The WASI (Wechsler, 1999) is a standardized abbreviated intelligence test which provides an estimate of general cognitive ability. Vocabulary and matrix reasoning subtests were administered to all participants to obtain an IQ estimate. The IQ score derived from two subtests has an average reliability coefficient of .96.

2.6.3 Woodcock-Johnson Tests of Achievement – 3rd edition (WJ-III).

The WJ-III (Woodcock et. al., 2001) is a standardized measure of academic achievement. The core reading, writing, and mathematics subtests were administered. The WJ-III subtests demonstrate strong reliabilities (.80 or higher).

2.6.4 Conners' Parent Rating Scale-Revised (CPRS).

The Conners' Scales (Conners, 1997) are often used to screen for ADHD in children and adolescents. The CPRS assesses inattentive, hyperactive and impulsive symptomotology, and

measures behaviours which are often observed in youth with ADHD, such as social problems, anxiety, perfectionism, oppositionality and emotional lability. The CPRS demonstrates high internal consistency, with coefficient alphas ranging from .81- .92 for males age 13 – 17 years, and excellent discriminant power for detecting ADHD (Conners, Sitarenios, Parker & Epstein, 1998). Given that 45% of the current sample reported a comorbid diagnosis of ADHD, the CPRS was used to evaluate ADHD symptomotology and define the samples for subgroup analysis. The CPRS was also used as a criterion for inclusion in the anxiety subgroup.

2.7 Outcome Measures

2.7.1 Behavior Rating Inventory of Executive Function – Parent Form (BRIEF).

The BRIEF (Gioia, Isquith, Guy, & Kenworthy, 2000) is an 86-item questionnaire designed to assess executive functioning in youth ages 5-18. The scale consists of two broad indexes (behavioural regulation and metacognition) in addition to a global executive composite. The BRIEF demonstrates high internal consistency and moderate correlations between parent and teacher report. Construct validity and concurrent validity as reported in the manual have been supported by a number of studies with clinical populations (Straus, Sherman & Spreen, 2006).

2.7.2 Child Behaviour Checklist (CBCL).

The CBCL (Achenbach & Rescorla, 2001) is a parent rating scale designed to assess child competencies and problematic behaviour in 6-to-18-year olds. Parents were asked to rate the severity of their child's internalizing (eg. anxious, depressed) and externalizing (eg. noncompliant, hyperactive, aggressive) symptoms, as well as social problems, somatic complaints, and thought problems. The CBCL demonstrates very high test-retest reliability (r=.90) and moderate to high internal consistency of scales (alpha = .72 - .97).

2.7.3 Youth Self-Report (YSR).

The YSR (Achenbach & Rescorla, 2001) is the self-report version of the CBCL. Adolescents were asked to rate their own competencies and problematic behaviour in the last six months using a three-point scale (never true, sometimes true, or often true). Internalizing, externalizing, and total problem scores were generated, along with syndrome scales and DSM-oriented scales

that parallel those of the CBCL. The YSR demonstrates moderate to high test-retest reliability (r=.79 - .88) and moderate to high internal consistency of scales (.55 - .95).

2.7.4 Modified Mindful Attention Awareness Scale (MMAAS).

The Modified Mindful Attention Awareness Scale (MMAAS; Miners, 2008) was adapted from Brown and Ryan's trait mindfulness scale to reflect language and situations commonly encountered by youth. The MMAAS was found to have a replicable factor structure and high internal consistency (alpha = .88) in a sample of 9-to-13-year olds (Miners, 2008). The MMAAS consists of 15 items assessing attention to and awareness of experiences in the present moment. Participants were asked to rate, on a scale from 1 (Almost Always) to 6 (Almost Never), how often they experience the following "everyday situations." (eg. I snack without being aware that I'm eating). A mean score for the 15 items was calculated, with higher scores indicating higher levels of mindfulness. The MMAAS was piloted with the phase 5 group only.

3 Results

3.1 Data Analysis

All analyses were conducted on the subscale T-scores of each measure, with the exception of the MMAAS, which yielded a total average score rather than T-scores. Pre-test differences between groups on baseline scores were evaluated using independent samples *t*-tests. Differences in change on outcome variables after the intervention period were assessed using a 2 (group: MMA vs. WL) by 2 (time: Time 1 vs. Time 2) repeated measures analysis of variance (ANOVA). An analysis of covariance (ANCOVA) was conducted when the underlying assumption of homogeneity of slopes was met. Although ANCOVA is a more powerful and precise test of differences in change than ANOVA (Rausch, Maxwell & Kelley, 2003), results are not interpretable if this assumption is violated. Since it was not possible to conduct ANCOVA on all of the variables, and the results of ANCOVA supported the results of repeated measures ANOVA, only the latter results are described. Results are presented in four sections. First, pre- and post-test group differences within the entire sample are described. Second, group differences within a subset of adolescents with parent-reported ADHD symptomotology are described. Third, group differences within a subset of adolescents with parent-reported anxiety

symptomotology are described. Finally, changes in levels of mindfulness amongst phase 5 participants are described.

3.2 Total Sample

Results of independent sample *t*-tests confirmed that there were no differences between the MMA and WL group on baseline levels of executive function, or parent- and self-reported behaviour problems. Differences in change on parent ratings (BRIEF and CBCL) and self-report (YSR) after the intervention period were assessed using a 2 (Group: MMA vs. WL) by 2 (Time: Time 1 vs. Time 2) repeated measures ANOVA, shown in Table 1. No significant Group or Group x Time interaction effects were found on any of the measures.

3.2.1 Parent ratings.

There were several significant time effects. On the BRIEF, the time effect was significant for the emotional control subscale, the plan/organize subscale, and the metacognition index. On the CBCL, a significant time effect was found for the following subscales: internalizing problems, total problems, social problems, DSM anxiety problems, and DSM ADHD problems.

3.2.2 Adolescent self-report.

A significant time effect was found on the following YSR subscales: internalizing problems, externalizing problems, total problems, social problems, DSM affective problems, DSM anxiety problems, DSM somatic problems, DSM ADHD problems, and DSM oppositional defiant problems.

3.3 Subgroup: Co-Morbid LD/ADHD Diagnosis

It was hypothesized that MMA participants with ADHD would show greater improvements in behavioural regulation, externalizing behaviour, and social skills than WL participants with ADHD. Participants who had a previous diagnosis of ADHD and who met study criteria for LD[1] were included in the following analyses. A total of 14 MMA and 11 WL participants had comorbid LD and ADHD diagnoses. Independent samples *t*-tests found no significant differences

[1] Participants with a previous diagnosis of non verbal LD were excluded from the analysis because no data were provided to confirm the diagnosis.

between groups on any of the outcome variables at Time 1. Differences in change on parent ratings (BRIEF and CBCL) and self-report (YSR) after the intervention period were assessed using a 2 (Group: MMA vs. WL) by 2 (Time: Time 1 vs. Time 2) repeated measures ANOVA. See Table 2 for a summary of results.

3.3.1 Parent ratings.

BRIEF data from 11 MMA parents and 11 WL parents were analysed. No significant Group or Group x Time interaction effects were found. Significant time effects were found on the behavioural regulation index and the metacognition index, as well as the shift, emotional control, working memory, plan/organize, and monitor subscales. CBCL data from 10 MMA parents and 11 WL parents were analysed. A significant Group x Time interaction effect was observed for externalizing problems $F(1,19) = 5.97$, $p < .05$, partial $\eta^2 = .24$, oppositional defiant problems $F(1,19) = 7.41$, $p < .05$, partial $\eta^2 = .28$, and conduct problems $F(1,19) = 9.91$, $p < .01$, partial $\eta^2 = .34$ (see Figure 1). Significant time effects were found for externalizing problems, total problems, social problems, DSM ADHD problems, and DSM oppositional defiant problems. Complete follow-up data was only available for three participants, preventing statistical analysis of changes from post-test to follow-up.

3.3.2 Adolescent self-report.

No significant Group or Group x Time interaction effects were found. A significant time effect was revealed for the following subscales of the YSR: total problems, social problems, and DSM oppositional defiant problems.

3.4 Subgroup: Hyperactive/Impulsive Symptoms

Exploratory subgroup analyses were conducted to determine whether participants with different ADHD profiles (primarily hyperactive/impulsive symptoms vs. primarily inattentive symptoms) exhibited different patterns of results. To be included in the hyperactive/impulsive (H/I) subgroup, participants must have demonstrated clinically elevated levels of H/I symptoms as indicated by a T-score of 65 or greater on the DSM H/I subscale of the CPRS. In addition,

participants must have met study criteria for LD[2]. A total of 29 (12 MMA, 17 WL) participants met criteria for inclusion in the subgroup.

Independent *t*-tests were conducted to explore group differences on baseline scores at Time 1. At time 1, youth in the WL group reported significantly higher levels of externalizing problems (M=61.47, SD=11.07), t(27) = -2.30, p<.05, and DSM conduct problems (M=63.06, SD=9.61), t(27)=-2.56, *p*<.05, than did youth in the MMA group (M=51.92, SD=10.99 and M=55.67, SD=5.93, respectively) at Time 1. No other significant differences were found on levels of H/I symptoms or on outcome variables at Time 1.

Differences in change on parent ratings (BRIEF and CBCL) and self-report (YSR) after the intervention period were assessed using a 2 (Group: MMA vs. WL) by 2 (Time: Time 1 vs. Time 2) repeated measures ANOVA. See Table 3 for a summary of results.

3.4.1 Parent ratings.

Data from 11 MMA parents and 13 WL parents were analysed. Repeated measures ANOVA revealed a significant Group x Time interaction for monitoring problems on the BRIEF, $F(1,22) = 6.90$, $p < .05$, partial $\eta^2 = .24$ (see Figure 2). Significant time effects were found for the behavioural regulation index and metacognition index, as well as the emotional control, plan/organize, and monitor subscales. A significant Group x Time interaction effect was observed for social problems on the CBCL, $F(1,22) = 10.20$, $p < .01$, partial $\eta^2 = .32$ (see Figure 2). Significant time effects were found for the following scales on the CBCL: externalizing problems, total problems, social problems, and DSM oppositional defiant problems. Complete follow-up data were only available for four participants, preventing statistical analysis of changes from Time 2 to Time 3.

3.4.2 Adolescent self-report.

Repeated measures ANOVAs were conducted on the YSR data of 12 MMA and 13 WL participants. A significant Group x Time interaction effect was observed for externalizing

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[2] Participants with a previous diagnosis of non verbal LD were excluded from the analysis because no data were provided to confirm the diagnosis.

problems $F(1,23) = 4.57$, $p < .05$, partial $\eta^2 = .17$, and conduct problems $F(1,23) = 5.11$, $p < .05$, partial $\eta^2 = .18$, with the WL group showing a decrease in symptoms and the MMA group showing an increase in symptoms in both cases (See Figure 3). Significant time effects were found for the following YSR scales: total problems, social problems, and DSM oppositional defiant problems. Complete follow-up data were only available for seven participants, precluding statistical analysis of changes from Time 2 to Time 3.

3.5 Subgroup: Inattentive Symptoms

To be included in the inattentive subgroup, participants must have demonstrated clinically elevated levels of inattentive symptoms as indicated by a T-score of 65 or greater on the DSM Inattentive subscale of the CPRS, in addition to meeting criteria for LD[3]. A total of 33 participants (15 MMA, 18 WL) met inclusion criteria. Independent samples *t*-tests were conducted to explore group differences on baseline scores at Time 1. There were no differences between the MMA and WL group on baseline levels of inattention, executive function, or parent- and self-reported behaviour problems. Differences in change on parent ratings (BRIEF and CBCL) and self-report (YSR) after the intervention period were assessed using a 2 (Group: MMA vs. WL) by 2 (Time: Time 1 vs. Time 2) repeated measures ANOVA. See Table 4 for a summary of results.

3.5.1 Parent ratings.

Repeated measures ANOVAs were conducted on BRIEF data from 13 MMA parents and 14 WL parents. No significant Group or Group x Time interaction effects were found. Significant time effects were found for the behavioural regulation index and metacognition index, as well as the emotional control, plan/organize, and monitor subscales. On the CBCL, the following Group x Time interaction effects approached significance: externalizing problems, social problems, and DSM oppositional defiant problems. Significant time effects were found for the following subscales of the CBCL: externalizing problems, total problems, social problems, DSM ADHD problems, DSM oppositional defiant problems, and DSM conduct problems.

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[3] Participants with a previous diagnosis of non verbal LD were excluded from the analysis because no data were provided to confirm the diagnosis.

3.5.2 Adolescent self-report.

Repeated measures ANOVAs were conducted on YSR data from 15 MMA and 14 WL participants. There were no significant Group or Group x Time interaction effects. Significant time effects were found for total problems, social problems, and DSM oppositional defiant problems.

3.6 Subgroup: Anxiety Symptoms

It was hypothesized that anxious adolescents in the MMA group would report greater reductions in anxiety than those in the WL group. In order to be included in the anxiety subgroup, participants must have met criteria for LD[4] and demonstrated clinically elevated levels of anxiety symptomotology as indicated by a T-score of 65 or greater on the anxious/shy subscale of the CPRS. A total of 29 participants (12 MMA, 17 WL) met inclusion criteria. Independent *t*-tests conducted to explore group differences on baseline scores at Time 1 showed no significant differences in baseline levels of the CPRS anxious/shy scale. Parent ratings on the CBCL Syndrome Scale: Anxious/Depressed were significantly higher for the WL group (M=69.53, SD=8.48) than the MMA group (M=62.55, SD=7.08) at Time 1, $t(26) = 2.27$, $p<.05$. Parent ratings on the CBCL DSM Scale: Anxiety Problems approached significance, with the WL group trending toward higher scores than the MMA group, $t(26)=1.99$, $p=.057$. No other significant differences were found on the parent or self-report measures at Time 1. Differences in change on parent ratings (BRIEF and CBCL) and self-report (YSR) after the intervention period were assessed using a 2 (Group: MMA vs. WL) by 2 (Time: Time 1 vs. Time 2) repeated measures ANOVA. See Table 5 for a summary of results.

3.6.1 Parent ratings.

Data from 10 MMA parents and 15 WL parents were analysed. There were no significant interaction Group or Group x Time interaction effects on the CBCL. A significant time effect was found for the following scales: internalizing problems, total problems, social problems, anxious/depressed syndrome scale, and DSM anxiety problems.

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[4] Participants with a previous diagnosis of non verbal LD were excluded from the analysis because no data were provided to confirm the diagnosis.

3.6.2 Adolescent self-report.

Repeated measures ANOVA revealed a significant Group x Time interaction effect for DSM anxiety problems on the YSR (n=11MMA, 15WL), $F(1,24) = 7.65$, $p < .05$, partial $\eta^2 = .24$ (see Figure 4). Significant time effects were found for internalizing problems, externalizing problems, total problems, social problems, DSM affective problems, anxious/depressed syndrome scale, and DSM anxiety problems. Complete follow-up data were only available for nine participants, preventing statistical analysis of changes from Time 2 to Time 3.

3.7 Changes in Levels of Mindfulness

The MMAAS was piloted with 10 MMA participants. A paired samples t-test revealed no significant change in self-reported mindfulness from Time 1 to Time 2, $t(9)=.396$, $p=.70$.

4 Discussion

The objective of the current study was to evaluate the impact of the Mindfulness Martial Arts program on executive function (EF), internalizing and externalizing behaviour, and social skills in a mixed clinical sample of adolescent boys with LD. The hypotheses were partially supported. When the total sample was analyzed, significant time effects were found for all measures, but there appeared to be no improvements attributable to the MMA program itself. During the four month interval between pre- and post-testing, participants in both groups and their parents reported significant change. This is not surprising given the rapid cognitive, academic and social development associated with adolescence. As such, it was critical to include a control group to differentiate typical growth from treatment effects.

The diverse clinical profiles of the participants masked improvements that occurred in specific subsets of youth. Approximately 45% of the sample was formally diagnosed with ADHD. Among this subgroup, those who completed the MMA program exhibited significant improvements in parent-rated externalizing behaviour, oppositional defiant problems, and conduct problems, compared to boys on the waitlist. Further analyses revealed distinct effects for adolescents with primarily hyperactive/impulsive symptoms compared to those with primarily inattentive symptoms. Boys with clinically elevated hyperactive/impulsive symptomotology at Time 1 showed improvements in parent-rated social problems and monitoring skills (a component of EF) after completing the MMA program. Interestingly, H/I youth reported an

increase in their own externalizing behaviour and conduct problems, while WL youth reported a decrease. It is possible that adolescents within the MMA group influenced each other. Frequent exposure to peers who exhibit externalizing behaviour may cause an increase in such behaviour, especially if it is reinforced by escape or attention. Alternatively, the increase in self-reported difficulties may be due to the improved self-monitoring skills that developed over the course of the program. Given that parents of these youth did not report an increase in externalizing behaviour, it is possible that MMA participants simply became more aware of their difficulties in this domain. If this is the case, higher scores at post-test may actually represent improved problem recognition, which is an initial step towards behaviour change. Adolescents with clinically elevated inattentive symptomotology showed a trend towards improved externalizing and oppositional defiant behaviour, as well as improved social functioning, with parent reports approaching significance. This subgroup did not exhibit improved EF resulting from the intervention, nor were there changes in self-reported behaviour problems.

These results support and expand upon previous research on mindfulness training for individuals with ADHD. We found reductions in externalizing behaviour similar to those reported by Bogels et. al.'s (2008) study of adolescents with externalizing disorders. Although the waitlist control design used by Bogels et. al. was strong, the small sample size and mixed diagnoses made interpretation of the results difficult. Where only 4 participants in the former study had a diagnosis of ADHD and 11 had a diagnosis of oppositional defiant or conduct disorder, 29 participants (15 MMA and 14 WL) in the current study reported a diagnosis of ADHD and only 2 had a diagnosis of oppositional defiant or conduct disorder. Zylowska et. al.'s (2008) feasibility study reported positive impacts of mindfulness training for individuals with ADHD, but there was no comparison group and two-thirds of the sample were adults. As such, the current findings provide stronger support for the clinical applications of mindfulness for teenagers with ADHD than previous studies. Further, the current study is the first to explore the differential impact of mindfulness training for adolescents exhibiting clinical levels of hyperactive/impulsive versus inattentive symptoms.

Approximately 40% of the overall sample demonstrated high levels of parent-reported anxiety at Time 1. Of these, approximately 12% were formally diagnosed with an anxiety disorder. Analyses conducted on the subset of youth with clinically elevated anxiety symptomotology revealed significant improvements in self-reported anxiety following the MMA program. This

finding supports preliminary research suggesting that mindfulness may be an effective intervention for anxious children (Linden, 1973; Semple, Reid & Miller, 2005) and is in keeping with evidence that mindfulness effectively reduces anxiety in adults (Baer, 2003; Grossman, Niemann, Schmidt & Walach, 2004).

4.1 Limitations and Future Research Directions

Conducting a program evaluation in a clinical setting presented several challenges. Ethical and practical constraints prevented random assignment of participants to conditions or controlling for participant characteristics, such as type of LD or co-occurring disorders. Although attempts were made to document treatment received while on the waitlist, families were not prevented from seeking treatment outside of Integra. These methodological issues make interpretation of the results somewhat difficult. Attempts to artificially control the sample, however, would have reduced ecological validity and diminished the utility of the results for clinicians. Youth with LD often have co-occurring behavioural, social and/or emotional difficulties, which can make case management and treatment planning challenging. For this reason, evaluations of programs targeting youth with complex clinical presentations are needed.

The current study meets most of Gersten et al.'s (2005) quality indicators for quasi-experimental program evaluation studies, including adequate sample size; ample description of participants, interventionists, and the program itself; appropriate, valid and varied measures; pre-, post-, and follow-up assessments; documentation of attrition; and appropriate data analytic techniques. Treatment fidelity, however, was not measured; four of the five MMA groups were led by the developer of the program, and fidelity to the manual was assumed. The fifth and largest MMA group was led by a new therapist instructor, which may have impacted outcomes in this group. It will be particularly important for future evaluations of MMA to include an assessment of treatment fidelity because new interventionists are currently being trained to deliver the program on a wider scale.

Although self-reports of behaviour change can give valuable information about the subjective experience of participants, there are some disadvantages to using self-report measures for adolescents with LD and ADHD. These adolescents often overestimate their competencies and underestimate the severity of their difficulties to a greater extent than their peers, a tendency known as the positive illusory bias. This bias is evident in ratings of scholastic achievement

(Heath & Glen, 2005; Stone & May, 2002) and behavioural difficulties such as conduct problems, inattention, hyperactivity and impulsivity (Haydicky, Timmermanis & Wiener, 2009). It is possible that baseline ratings of behaviour in the current study did not accurately reflect the problems experienced by the participants. As such, treatment effects may not have been captured. Although parent reports were obtained, they may have been biased by expectancy effects. Reports from teachers blind to the treatment condition of students or direct observation of behaviour may have been more reliable indicators of change. Given the possibility that MMA improves problem recognition in youth with hyperactive/impulsive behaviour, the potential impact of mindfulness training on the PIB should be investigated.

The hypothesis that mindfulness training would improve EF was only partially supported. Although changes in monitoring were observed in hyperactive/impulsive boys, there were no changes in inhibition, cognitive flexibility or emotional control. It is possible that the parent-report questionnaire used to measure EF was not sensitive enough to detect changes. Future evaluations of the MMA program should include behavioural and neurological measures of EF to obtain more precise and reliable indicators of change. Researchers at Integra are currently using computerized tasks to measure sustained attention, impulse control, and set-shifting in MMA participants. Psychological mechanisms of mindfulness should also be explored to determine the processes involved in behaviour change.

The current study eliminated participants with non-verbal LD from subgroup analyses. Since the cognitive profile and behavioural correlates of these students are different from those with language-based LD, the current results may not be representative of adolescents with non-verbal LD or disorders with similar features, such as Asperger Syndrome (Ryburn, Anderson & Wales, 2009). Future research should investigate the impact of MMA on the core deficits of non-verbal LD, such as social interaction and sensitivity to non-verbal cues, adaptability, visual-spatial perception, and coordination (Harnadek & Rourke, 1994). The unique combination of mindfulness, CBT and physical skills training delivered in a group setting is well-suited to address the range of difficulties experienced by students with non-verbal LD.

In order to parse out the relative impact of each of the three components of MMA, future studies should include comparison groups exposed to mindfulness alone, CBT alone, and martial arts alone. It is possible that behavioural improvements, particularly improved social skills, are due to

regular contact with age and gender-matched peers under the guidance of an adult model. MMA should be compared to other group programs such as social skills training, support groups, sports teams and clubs to determine whether mindfulness training is of additional benefit. Future studies should also include a qualitative component to explore the acceptability, feasibility, and perceived benefits of the program for teenagers.

MMA is significantly longer than most mindfulness training programs, with 20 sessions compared to the typical 8 – 12. Despite improvements in behaviour, MMA participants did not report higher levels of mindfulness after the intervention. It may be that adolescents, especially those with learning and attention difficulties, require more practice and reinforcement to internalize skills. Anecdotal reports from the MMA instructors indicate that some students only begin to grasp the core concepts of the program towards the final few sessions, and that another 20 sessions is required to consolidate the knowledge and skills. Students who return for an advanced MMA group should be tracked to assess weekly improvements and potential ceiling effects.

4.2 Clinical Implications and Conclusion

While statistical significance is often regarded as the benchmark of a successful study, program evaluation research must also take into account the clinical significance of the results. Effect size estimates are one way to determine the impact of an intervention. The current study obtained partial eta squared values for significant interaction effects ranging from .24 - .34, which are large by social scientific research standards. These values represent the proportion of variation in behaviour change attributable to the intervention excluding other factors, suggesting that MMA had a substantial impact on the behaviour of participants. Since many researchers erroneously report partial eta as classical eta (Pierce, Block & Aguinis, 2004), causing overestimation of effects, direct comparisons between the current study and other intervention studies will not be made.

In spite of the length of treatment, the group format of MMA is cost-effective for agencies with large client loads and extensive waiting lists. The therapist to client ratio (approximately 1:8) allows more children to access services sooner. As results of the current study suggest that MMA has different impacts for clients with different clinical profiles, MMA should be targeted to participants who would derive the most benefit from it. Children on the waitlist should be

screened for attention problems and anxiety prior to enrolment in MMA so agencies can offer their clients interventions with the most potential for impact and allocate limited resources more effectively.

The expansion and widespread implementation of MMA is restricted by the extensive training required to deliver the program. In addition to training in psychotherapy, therapist instructors need a background in mindfulness and martial arts. One potential solution for dealing with a shortage of trained therapists is having advanced students of MMA assist instructors, allowing the groups to grow to 10 – 12 students. This would also add a peer modelling component to MMA.

The high rate of retention in the program is noteworthy given that previous mindfulness research reported high dropout rates. Since it was piloted in 2002, only four participants have dropped out of MMA, and none before the 13th session. Anecdotal reports suggest that adolescents find the program enjoyable and beneficial, but further research is needed to determine what factors enhance motivation to complete the program. Results of the current study suggest that MMA is an acceptable alternative intervention for youth with LD. Mindfulness training shows promise for the management of behavioural, emotional and social difficulties experienced by youth with LD.

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Appendix

Information Letter and Parental Consent Form

Dear Parent/Guardian/Study Participant:

We are writing to ask permission for you to participate in a research study that we are conducting at Integra Children's Mental Health Centre at the Ontario Institute for Studies in Education, University of Toronto (OISE/UT). The purpose of the study is to examine the effectiveness of Integra's Mindfulness Martial Arts program (MMA) for youth with learning disabilities.

What is Mindfulness Martial Arts?

MMA is a 20-week group program for youth aged 12-18 who have learning disabilities and problems with anxiety, anger, or impulsivity. The goals of the program are to develop their self-control, adaptability to change, problem solving, self-awareness, social interaction, self-defense skills, self-confidence and self-esteem. This program has been offered at Integra for 5 years. For the past 2 years Integra has been collecting information from participants and parents. Early research has shown promising results in achieving the program's goals.

What do I have to do?

The study will involve youth and parents filling out questionnaires at 4 time points in sessions of approximately 1 hour:

1. Pre- treatment session 1
2. Pre- treatment session 2 (this session will last 2-3 hours)
3. Post-treatment
4. Three-month follow-up

What about our privacy?

The privacy of you and your child will be respected. All questionnaire data are considered strictly confidential and will not be shared with anyone outside of Integra or Dr. Wiener's and Dr. Ducharme's research groups at OISE/UT. Any research reports that result from this study will be in a group format, with all identifying information of participants removed.

Does my child have to participate in the research?

Participation in this research is voluntary. If you and/or your child decide not to participate, it will not impact the services you receive at Integra.

Are there any risks?

Other than investment of time, there are no known risks associated with participating in the study. One *potential* risk is that some youth may feel some discomfort when answering questions about his/her learning and behaviours. They will be prepared for this situation during the consent procedure. They will be told that they may skip any question, request a break, or withdraw from the study at any time without penalty. Parents and youth are encouraged to speak with Integra Child and Family therapists if they need further support.

What are the benefits?

In addition to contributing to scientific knowledge about learning disabilities and the MMA treatment, there are several benefits that participants will receive from the study.

- Youth participating in the program may get personal benefit from their participation in the form of improved self-confidence and self-esteem, reduction in problem behaviours, and increased self-control. Youth in the Control group will be offered the MMA program during the following year if this is appropriate for them.

- Parents will receive a written report of their child's cognitive, academic, and social and emotional functioning and recommendations for intervention.

- Dr. Wiener's research group has created a web site for participants in her studies, communicating the results of the studies and providing links to resources for individuals with LD and ADHD.

- Youth who are in high school will receive Community Service Certificates for the time they spend completing tests or questionnaires in connection with this study (approximately 8 hours). Youth in the Control group who do not want a Community Service Certificate will be compensated $20 per session.

We believe that this research is an important contribution to our knowledge about the treatment of social-emotional difficulties associated with learning disabilities. We would be grateful for your participation. If you have any questions, or if you would like additional information, please call Paul Badali, a clinician at Integra at 416- 486-8055 ext. 228, or Lesley Daniels, Psychologist at Integra at 416-486-8055 ext. 240. If you have any information about your rights as a participant, contact the Office of Research Ethics at 416-946-3273.

Sincerely,

_____	_____
Paul Badali, M.S.W., RSW	Lesley Daniels, Ph.D
Program Leader - Integra	Psychologist - Integra
_____	_____
Marjory Phillips, C. Psych	Judith Wiener, Ph.D., C. Psych
Director of Psychology – Integra	Prof. of School & Clinical Psychology - OISE
_____	_____
Joe Ducharme, Ph.D.	Jill Haydicky, B.A.
Associate Prof. of School & Clinical Psych	Masters Student – OISE/UT

Tables

Table 1

Means, Standard Deviations and Significant Effects† of Repeated ANOVAs for Total Sample

Outcome Variables	Group	Pre-Test M(SD)	Post-Test M(SD)	Group Effect	Time Effect	Group x Time Effect
BRIEF *df*(1, 53)						
Beh. Regulation	MMA	68.52(13.40)	64.14(10.55)	F=1.97, *p*=.17, η^2 =.04	*F=4.10, *p*=.048, η^2=.07	F=1.94, *p*=.17, η^2 =.04
	WL	62.04(13.97)	61.23(15.05)			
Inhibit	MMA	65.52(12.99)	62.76(12.82)	F=.16, *p*=.69, η^2 =.00	F=.23, *p*=.64, η^2 =.00	F=2.60, *p*=.11, η^2 =.05
	WL	61.81(16.46)	63.31(19.40)			
Shift	MMA	70.28(13.44)	65.76(12.02)	F=3.13, *p*=.08, η^2 =.06	F=2.55, *p*=.12, η^2 =.05	F=2.22, *p*=.14, η^2 =.04
	WL	62.50(12.96)	62.35(13.16)			
Emo Control	MMA	62.79(13.89)	58.59(9.76)	F=2.28, *p*=.14, η^2 =.04	**F=7.86, *p*=.01, η^2=.13	F=.26, *p*=.62, η^2 =.01
	WL	57.69(12.72)	54.77(10.79)			
Metacognition	MMA	70.31(7.53)	67.45(8.65)	F=.09, *p*=.76, η^2 =.00	*F=5.36, *p*=.02, η^2=.09	F=.38, *p*=.54, η^2 =.01
	WL	69.08(7.73)	67.42(9.62)			
Initiate	MMA	68.69(7.18)	66.86(10.68)	F=.07, *p*=.79, η^2 =.00	F=1.64, *p*=.21, η^2 =.03	F=.04, *p*=.85, η^2 =.00

	WL	67.88(7.61)	66.54(10.75)			
Working Memory	MMA	68.34(9.98)	66.62(9.75)	F=.45, p=.51, η^2=.01	F=1.71, p=.20, η^2=.03	F=.04, p=.84, η^2=.00
	WL	69.85(10.34)	68.58(11.82)			
Plan/Organize	MMA	69.83(7.12)	66.59(8.65)	F=.74, p=.39, η^2=.01	**F=10.52, p=.00, η^2=.17	F=.00, p=.97, η^2=.00
	WL	68.15(8.44)	64.85(8.72)			
Org. Materials	MMA	62.38(7.47)	60.90(8.24)	F=.59, p=.45, η^2=.01	F=.13, p=.72, η^2=.00	F=2.95, p=.09, η^2=.05
	WL	59.46(9.62)	60.42(9.06)			
Monitor	MMA	69.55(7.90)	66.24(8.09)	F=.13, p=.72, η^2=.00	F=2.92, p=.09, η^2=.05	F=1.75, p=.19, η^2=.03
	WL	67.35(10.12)	66.92(9.60)			
CBCL df(1,50)						
Internalizing	MMA	62.08(9.12)	58.04(9.61)	F=.41, p=.53, η^2=.01	**F=12.48, p=.00, η^2=.20	F=.73, p=.40, η^2=.01
	WL	62.96(11.22)	60.50(9.87)			
Externalizing	MMA	58.31(11.36)	55.62(8.97)	F=.79, p=.38, η^2=.02	F=2.74, p=.10, η^2=.05	F=2.59, p=.11, η^2=.05
	WL	54.65(9.23)	54.62(9.86)			
Total Problems	MMA	63.27(7.50)	59.77(6.61)	F=.02, p=.88, η^2=.00	**F=11.19, p=.00, η^2=.18	F=.83, p=.37, η^2=.02
	WL	62.23(7.80)	60.23(7.72)			
Social Problems	MMA	65.81(9.54)	61.65(6.58)	F=.01, p=.91, η^2=.00	**F=14.47, p=.00, η^2=.22	F=1.46, p=.23, η^2=.03
	WL	64.54(10.29)	62.38(9.14)			

Affective Problems	MMA	64.88(7.89)	62.19(8.40)	F=.00, p=1.00, η^2=.00	F=3.81, p=.06, η^2=.07	F=.28, p=.60, η^2=.01
	WL	64.31(8.97)	62.77(9.00)			
Anxiety Problems	MMA	60.46(8.68)	58.31(8.29)	F=1.19, p=.28, η^2=.02	*F=6.83, p=.012, η^2=.12	F=.26, p=.61, η^2=.01
	WL	63.38(9.32)	60.19(8.73)			
Somatic Problems	MMA	57.62(7.44)	55.85(6.09)	F=.19, p=.67, η^2=.00	F=3.62, p=.06, η^2=.07	F=.03, p=.86, η^2=.00
	WL	58.31(8.93)	56.85(8.00)			
ADHD Problems	MMA	62.92(6.97)	60.31(6.88)	F=.02, p=.89, η^2=.00	*F=4.46, p=.04, η^2=.08	F=1.42, p=.24, η^2=.03
	WL	61.69(7.77)	60.96(9.27)			
Oppositional Defiant	MMA	61.12(10.23)	57.69(6.36)	F=1.81, p=.19, η^2=.04	F=3.45, p=.07, η^2=.06	F=2.75, p=.10, η^2=.05
	WL	56.92(7.12)	56.73(6.66)			
Conduct Problems	MMA	59.23(8.48)	56.65(6.16)	F=.42, p=.52, η^2=.01	F=3.66, p=.06, η^2=.07	F=3.25, p=.08, η^2=.06
	WL	56.81(6.27)	56.73(6.93)			
YSR df(1,58)						
Internalizing	MMA	55.67(11.43)	52.00(10.15)	F=.19, p=.67, η^2=.00	**F=14.87, p=.00, η^2=.20	F=.44, p=.51, η^2=.01
	WL	55.30(11.53)	50.11(10.88)			
Externalizing	MMA	54.88(10.49)	52.76(11.64)	F=.50, p=.48, η^2=.01	**F=8.53, p=.005, η^2=.13	F=.67, p=.42, η^2=.01
	WL	53.74(12.22)	49.96(11.39)			
Total Problems	MMA	58.27(10.31)	53.97(10.79)	F=1.04, p=.31, η^2=.02	**F=19.74, p=.00, η^2=.25	F=.20, p=.66, η^2=.00

	WL	56.07(11.42)	50.81(11.34)			
Social Problems	MMA	59.76(9.57)	56.06(6.78)	F=.50, p=.49, η^2=.01	**F=14.42, p=.00, η^2=.20	F=.001, p=.97, η^2=.00
	WL	58.41(9.09)	54.78(6.46)			
Affective Problems	MMA	59.09(7.76)	55.85(6.81)	F=.28, p=.60, η^2=.01	**F=16.47, p=.00, η^2=.22	F=.10, p=.76, η^2=.00
	WL	58.48(8.34)	54.70(5.50)			
Anxiety Problems	MMA	57.61(6.97)	54.45(5.20)	F=.19, p=.67, η^2=.00	**F=9.54, p=.00, η^2=.14	F=.64, p=.43, η^2=.01
	WL	56.33(7.32)	54.48(5.69)			
Somatic Problems	MMA	57.06(7.59)	55.42(6.09)	F=.43, p=.51, η^2=.01	**F=5.49, p=.02, η^2=.09	F=.04, p=.85, η^2=.00
	WL	56.22(6.16)	54.30(5.64)			
ADHD Problems	MMA	60.45(7.50)	57.42(6.62)	F=.002, p=.96, η^2=.00	**F=5.42, p=.02, η^2=.09	F=.87, p=.36, η^2=.02
	WL	59.67(8.58)	58.37(7.64)			
Oppositional Defiant	MMA	57.15(6.43)	54.85(5.95)	F=.31, p=.58, η^2=.01	**F=14.94, p=.00, η^2=.21	F=.00, p=.97, η^2=.00
	WL	56.30(7.28)	54.04(4.78)			
Conduct Problems	MMA	57.64(7.49)	57.79(8.18)	F=.42, p=.52, η^2=.01	F=1.56, p=.22, η^2=.03	F=2.07, p=.16, η^2=.04
	WL	57.52(9.21)	55.41(7.24)			

Note. † Effect sizes reported are partial eta squared. *p<.05. **p<.01.

Table 2

Means, Standard Deviations and Results[†] *of Repeated ANOVAs for ADHD/LD Subgroup*

Outcome Variables	Group	Pre-Test M(SD)	Post-Test M(SD)	Group Effect	Time Effect	Group x Time Effect
BRIEF *df*(1,20)						
Beh. Regulation	MMA	75.27(7.14)	68.18(8.17)	F=4.32, *p*=.05, η^2=.18	*F=6.20, *p*=.02, η^2=.24	F=1.22, *p*=.28, η^2=.06
	WL	63.36(13.70)	60.64(16.19)			
Inhibit	MMA	71.73(7.31)	68.91(11.48)	F=2.05, *p*=.17, η^2=.09	F=.06, *p*=.80, η^2=.00	F=1.37, *p*=.26, η^2=.06
	WL	61.64(14.01)	63.45(18.80)			
Shift	MMA	73.00(12.90)	66.18(10.90)	F=4.00, *p*=.06, η^2=.17	*F=5.14, *p*=.04, η^2=.21	F=.10, *p*=.76, η^2=.01
	WL	62.45(13.81)	57.27(14.09)			
Emo Control	MMA	70.09(10.01)	61.73(6.04)	F=3.30, *p*=.09, η^2=.14	**F=13.20, *p*=.00, η^2=.40	F=.96, *p*=.34, η^2=.05
	WL	61.00(13.08)	56.18(11.07)			
Metacognition	MMA	73.73(5.85)	68.00(10.51)	F=1.06, *p*=.32, η^2=.05	**F=10.05, *p*=.01, η^2=.33	F=.40, *p*=.53, η^2=.02
	WL	69.09(8.78)	65.27(10.46)			
Initiate	MMA	68.82(5.06)	64.82(8.65)	F=.15, *p*=.70, η^2=.01	F=3.27, *p*=.09, η^2=.14	F=.10, *p*=.76, η^2=.01
	WL	69.45(8.34)	66.64(11.21)			
Working	MMA	75.00(5.87)	69.91(11.18)	F=1.75, *p*=.20, η^2=.08	*F=6.36, *p*=.02, η^2=.24	F=.27, *p*=.61, η^2=.01

Memory	WL	68.64(10.35)	65.27(13.29)			
Plan/Organize	MMA	72.18(7.00)	66.91(10.93)	F=1.55, p=.23, η^2=.07	**F=9.12, p=.007, η^2=.31	F=.05, p=.83, η^2=.00
	WL	67.55(8.48)	63.00(8.73)			
Org. Materials	MMA	63.36(5.77)	60.27(8.21)	F=.54, p=.47, η^2=.03	F=1.30, p=.27, η^2=.06	F=2.99, p=.10, η^2=.13
	WL	59.00(10.29)	59.64(8.63)			
Monitor	MMA	73.55(7.24)	65.00(11.30)	F=.65, p=.43, η^2=.03	**F=13.98, p=.00, η^2=.41	F=2.52, p=.13, η^2=.11
	WL	68.00(9.62)	64.55(9.46)			
CBCL df(1,19)						
Externalizing	MMA	64.80(5.56)	59.90(6.49)	F=5.15, p=.04, η^2=.21	**F=8.66, p=.01, η^2=.31	*F=5.97, p=.03, η^2=.24
	WL	54.82(8.74)	54.36(10.35)			
Total Problems	MMA	66.80(2.62)	60.50(6.84)	F=.55, p=.47, η^2=.03	**F=15.02, p=.00, η^2=.44	F=1.62, p=.22, η^2=.08
	WL	63.18(8.05)	60.00(8.41)			
Social Problems	MMA	67.10(7.94)	60.30(6.33)	F=.217, p=.65, η^2=.01	**F=21.09, p=.00, η^2=.53	F=1.00, p=.33, η^2=.05
	WL	67.36(8.35)	63.00(8.30)			
ADHD Problems	MMA	67.20(3.49)	64.10(7.40)	F=.48, p=.50, η^2=.03	*F=6.72, p=.02, η^2=.26	F=.00, p=.10, η^2=.00
	WL	64.91(8.54)	61.82(10.64)			
Oppositional	MMA	67.50(8.73)	60.30(6.11)	F=4.50, p=.05, η^2=.19	*F=7.80, p=.012, η^2=.29	*F=7.41, p=.014, η^2=.28
Defiant	WL	57.55(7.71)	57.45(7.31)			

Conduct Problems	MMA	62.70(6.02)	58.50(6.45)	F=1.97, p=.17, η^2=.04	F=3.75, p=.07, η^2=.17	**F=9.91, p=.005, η^2=.34
	WL	55.82(5.90)	56.82(7.36)			
YSR df(1,23)						
Externalizing	MMA	54.71(11.79)	55.07(10.91)	F=.37, p=.55, η^2=.02	F=1.79, p=.19, η^2=.07	F=2.51, p=.13, η^2=.10
	WL	54.27(11.90)	50.00(13.12)			
Total Problems	MMA	58.43(12.77)	55.07(10.76)	F=.37, p=.55, η^2=.02	**F=8.05, p=.009, η^2=.26	F=.64, p=.43, η^2=.03
	WL	57.09(9.36)	51.09(13.22)			
Social Problems	MMA	58.43(10.23)	56.43(7.21)	F=.03, p=.87, η^2=.00	*F=5.85, p=.02, η^2=.20	F=1.00, p=.33, η^2=.04
	WL	60.36(10.34)	55.55(7.06)			
ADHD Problems	MMA	61.21(7.97)	58.64(6.85)	F=.03, p=.86, η^2=.00	F=2.36, p=.14, η^2=.09	F=.00, p=.99, η^2=.00
	WL	60.73(10.41)	58.09(8.85)			
Oppositional	MMA	58.07(7.61)	56.60(5.72)	F=.14, p=.71, η^2=.01	*F=7.02, p=.01, η^2=.23	F=.39, p=.54, η^2=.02
Defiant	WL	57.55(8.34)	55.00(5.93)			
Conduct Problems	MMA	58.50(8.62)	58.21(8.88)	F=.51, p=.48, η^2=.02	F=.23, p=.63, η^2=.01	F=.07, p=.79, η^2=.00
	WL	56.55(9.62)	55.55(7.63)			

Note. † Effect sizes reported are partial eta squared. *p<.05. **p<.01.

Table 3

Means, Standard Deviations and Results[†] *of Repeated ANOVAs for Hyperactive/Impulsive Subgroup*

Outcome Variables	Group	Pre-Test M(SD)	Post-Test M(SD)	Group Effect	Time Effect	Group x Time Effect
BRIEF *df*(1,22)						
Beh. Regulation	MMA	74.36(9.78)	67.73(8.25)	F=.07, *p*=.79, η^2 =.00	*F=4.79, *p*=.04, η^2 =.18	F=3.62, *p*=.07, η^2 =.14
	WL	72.31(9.15)	71.85(12.71)			
Inhibit	MMA	74.09(7.74)	70.18(10.82)	F=1.89, *p*=.18, η^2 =.08	F=.12, *p*=.76, η^2 =.01	F=1.78, *p*=.20, η^2 =.06
	WL	76.23(9.05)	78.54(14.46)			
Shift	MMA	73.55(11.44)	67.45(10.71)	F=.34, *p*=.57, η^2 =.02	F=2.11, *p*=.16, η^2 =.09	F=2.22, *p*=.15, η^2 =.09
	WL	67.69(13.31)	67.77(13.35)			
Emo Control	MMA	65.64(15.40)	58.27(10.07)	F=3.30, *p*=.09, η^2 =.14	**F=14.85, *p*=.00, η^2=.40	F=2.38, *p*=.14, η^2 =.10
	WL	64.31(10.87)	61.15(9.63)			
Metacognition	MMA	76.00(6.07)	71.18(9.12)	F=.51, *p*=.48, η^2 =.02	*F=4.84, *p*=.04, η^2=.18	F=2.38, *p*=.14, η^2 =.10
	WL	71.62(8.27)	70.77(10.79)			
Initiate	MMA	70.55(5.89)	68.18(10.70)	F=.00, *p*=.98, η^2 =.00	F=.25, *p*=.62, η^2 =.01	F=.42, *p*=.53, η^2 =.02
	WL	69.31(7.40)	69.62(12.66)			
Working	MMA	77.18(5.36)	73.36(9.31)	F=.27, *p*=.61, η^2 =.01	F=1.58, *p*=.22, η^2 =.07	F=1.86, *p*=.19, η^2 =.08

Memory	WL	73.23(9.98)	73.38(12.67)			
Plan/Organize	MMA	73.45(6.62)	69.09(8.80)	F=1.46, p=.24, η^2=.06	**F=8.83, p=.007, η^2=.29	F=.26, p=.61, η^2=.01
	WL	68.85(9.13)	65.77(9.25)			
Org. Materials	MMA	65.82(5.88)	63.00(9.30)	F=.18, p=.68, η^2=.01	F=1.88, p=.18, η^2=.08	F=2.10, p=.16, η^2=.09
	WL	63.00(8.40)	63.08(9.09)			
Monitor	MMA	75.55(5.87)	68.55(7.63)	F=.06, p=.82, η^2=.00	*F=6.61, p=.02, η^2=.23	*F=6.90, p=.02, η^2=.24
	WL	71.23(9.85)	71.31(10.15)			
CBCL df(1,22)						
Externalizing	MMA	63.36(8.05)	59.64(8.03)	F=.10, p=.75, η^2=.01	*F=6.25, p=.02, η^2=.22	F=3.50, p=.08, η^2=.14
	WL	60.77(7.12)	60.23(8.35)			
Total Problems	MMA	67.45(3.86)	62.91(6.64)	F=.00, p=.99, η^2=.00	**F=9.12, p=.006, η^2=.29	F=2.23, p=.15, η^2=.09
	WL	66.00(7.28)	64.46(7.71)			
Social Problems	MMA	70.45(7.05)	62.36(5.56)	F=.41, p=.53, η^2=.02	**F=14.37, p=.00, η^2=.40	**F=10.18, p=.00, η^2=.32
	WL	68.62(9.65)	67.92(7.47)			
ADHD Problems	MMA	68.27(2.94)	64.64(7.59)	F=.04, p=.85, η^2=.00	F=2.17, p=.16, η^2=.09	F=2.80, p=.11, η^2=.11
	WL	66.85(6.48)	67.08(9.04)			
Oppositional	MMA	64.27(9.54)	59.27(6.83)	F=.10, p=.75, η^2=.01	*F=7.80, p=.011, η^2=.26	F=2.50, p=.13, η^2=.10
Defiant	WL	61.54(7.25)	60.15(6.83)			

Conduct Problems	MMA	62.82(5.96)	59.27(6.20)	F=.38, p=.54, η^2=.02	F=3.81, p=.06, η^2=.15	F=3.49, p=.08, η^2=.14
	WL	59.54(6.19)	59.46(7.45)			
YSR *df*(1,23)						
Externalizing	MMA	51.92(10.98)	54.00(9.44)	F=2.34, p=.14, η^2=.09	F=.33, p=.57, η^2=.01	*F=4.57, p=.04, η^2=.17
	WL	61.00(12.08)	57.38(10.07)			
Total Problems	MMA	56.75(11.15)	54.33(8.69)	F=1.24, p=.28, η^2=.05	*F=7.31, p=.01, η^2=.24	F=1.02, p=.32, η^2=.04
	WL	62.62(10.63)	57.31(11.37)			
Social Problems	MMA	59.58(9.02)	55.58(6.19)	F=.42, p=.52, η^2=.02	*F=11.54, p=.00, η^2=.33	F=.06, p=.81, η^2=.00
	WL	61.92(10.36)	57.31(7.45)			
ADHD Problems	MMA	61.33(8.00)	59.17(6.93)	F=1.82, p=.19, η^2=.07	F=1.11, p=.30, η^2=.05	F=.01, p=.92, η^2=.00
	WL	64.54(8.56)	62.77(7.73)			
Oppositional	MMA	55.17(6.03)	53.83(4.12)	F=3.29, p=.08, η^2=.13	*F=7.06, p=.01, η^2=.24	F=1.61, p=.22, η^2=.07
Defiant	WL	60.38(8.06)	56.62(4.96)			
Conduct Problems	MMA	55.67(5.93)	58.33(7.99)	F=.51, p=.48, η^2=.02	F=.00, p=.97, η^2=.00	*F=5.12, p=.03, η^2=.18
	WL	62.08(10.38)	59.31(8.40)			

Note. † effect sizes reported are partial eta squared. *p<.05. **p<.01.

Table 4

Means, Standard Deviations and Results[†] *of Repeated ANOVAs for Inattentive Subgroup*

Outcome Variables	Group	Pre-Test M(SD)	Post-Test M(SD)	Group Effect	Time Effect	Group x Time Effect
BRIEF *df*(1, 25)						
Beh. Regulation	MMA	73.46(9.13)	65.08(12.17)	F=.78, *p*=.39, η^2 =.03	*F=7.10, *p*=.01, η^2=.22	F=2.59, *p*=.12, η^2 =.09
	WL	66.07(15.16)	64.00(16.00)			
Inhibit	MMA	73.23(7.37)	67.69(13.44)	F=.90, *p*=.35, η^2 =.04	F=.84, *p*=.37, η^2 =.03	F=2.87, *p*=.10, η^2 =.10
	WL	64.14(17.44)	65.79(21.50)			
Shift	MMA	72.08(12.18)	64.46(14.60)	F=.03, *p*=.87, η^2 =.00	F=3.61, *p*=.07, η^2 =.13	F=2.21, *p*=.15, η^2 =.08
	WL	68.00(13.02)	67.07(12.61)			
Emo Control	MMA	65.69(14.29)	56.92(10.88)	F=.56, *p*=.46, η^2=.02	** F=12.95, *p*=.00,η^2=.34	F=1.07, *p*=.31, η^2 =.04
	WL	60.43(13.42)	55.57(10.95)			
Metacognition	MMA	74.54(6.28)	68.85(11.47)	F=.24, *p*=.63, η^2 =.01	*F=7.86, *p*=.01, η^2=.24	F=.92, *p*=.35, η^2 =.04
	WL	74.43(4.36)	71.64(8.70)			
Initiate	MMA	69.77(5.75)	66.62(12.29)	F=1.26, *p*=.27, η^2 =.05	F=.78, *p*=.39, η^2 =.03	F=.60, *p*=.45, η^2 =.02
	WL	71.50(5.22)	71.29(10.43)			
Working Memory	MMA	75.77(7.36)	70.62(11.18)	F=1.21, *p*=.28, η^2 =.05	F=3.22, *p*=.09, η^2 =.11	F=.86, *p*=.36, η^2 =.03

	WL	77.07(6.03)	75.43(9.64)			
Plan/Organize	MMA	72.46(6.37)	67.23(10.31)	F=.84, p=.37, η^2=.03	**F=11.36, p=.00, η^2=.31	F=.02, p=.88, η^2=.00
	WL	74.71(2.67)	69.00(7.08)			
Org. Materials	MMA	65.62(5.95)	61.92(9.62)	F=.76, p=.39, η^2=.03	F=3.38, p=.08, η^2=.12	F=2.90, p=.10, η^2=.10
	WL	61.21(8.16)	61.07(8.96)			
Monitor	MMA	72.85(7.50)	66.62(11.29)	F=.00, p=.99, η^2=.00	**F=11.89, p=.00, η^2=.32	F=.66, p=.43, η^2=.03
	WL	71.71(8.40)	67.86(10.45)			
CBCL df(1,25)						
Externalizing	MMA	60.46(10.20)	56.00(8.50)	F=.58, p=.46, η^2=.02	**F=8.26, p=.008, η^2=.25	F=4.06, p=.06, η^2=.14
	WL	55.86(9.77)	55.07(10.42)			
Total Problems	MMA	65.69(5.69)	60.23(8.00)	F=.27, p=.61, η^2=.01	**F=18.78, p=.00, η^2=.43	F=.90, p=.35, η^2=.04
	WL	66.00(6.58)	62.50(7.37)			
Social Problems	MMA	67.31(9.33)	60.23(6.91)	F=.09, p=.77, η^2=.00	**F=20.36, p=.00, η^2=.45	F=3.67, p=.07, η^2=.13
	WL	66.21(11.44)	63.36(9.23)			
ADHD Problems	MMA	67.15(3.69)	62.08(8.28)	F=.01, p=.92, η^2=.00	*F=5.60, p=.03, η^2=.18	F=3.00, p=.10, η^2=.11
	WL	64.71(7.77)	63.93(9.92)			
Oppositional Defiant	MMA	62.92(10.97)	57.00(5.66)	F=.56, p=.46, η^2=.02	*F=6.47, p=.02, η^2=.21	F=4.19, p=.051,η^2=.14
	WL	58.14(8.00)	57.50(7.26)			

Conduct Problems	MMA	61.00(6.83)	56.62(5.56)	F=.78, p=.39, η^2=.03	*F=7.27, p=.01, η^2=.23	F=3.52, p=.07, η^2=.12
	WL	57.14(6.23)	56.36(7.38)			
YSR *df*(1,27)						
Externalizing	MMA	52.87(10.43)	53.07(10.62)	F=.12, p=.73, η^2=.01	F=2.69, p=.11, η^2=.09	F=3.19, p=.09, η^2=.11
	WL	56.64(11.47)	52.00(11.52)			
Total Problems	MMA	58.20(9.75)	54.73(9.32)	F=1.04, p=.31, η^2=.02	**F=12.06, p=.00, η^2=.31	F=.97, p=.33, η^2=.04
	WL	60.29(11.12)	54.07(11.39)			
Social Problems	MMA	58.60(8.39)	55.93(6.08)	F=.42, p=.52, η^2=.02	**F=11.81, p=.00, η^2=.29	F=1.39, p=.25, η^2=.05
	WL	61.79(9.87)	56.21(6.89)			
ADHD Problems	MMA	62.07(8.28)	58.73(6.31)	F=.07, p=.79, η^2=.00	F=3.00, p=.095, η^2=.10	F=.07, p=.79, η^2=.00
	WL	62.29(9.25)	59.86(8.68)			
Oppositional Defiant	MMA	55.53(6.12)	54.07(4.92)	F=.20, p=.66, η^2=.01	*F=4.32, p=.047, η^2=.14	F=.15, p=.70, η^2=.01
	WL	56.79(7.86)	54.64(4.81)			
Conduct Problems	MMA	56.60(6.61)	57.47(7.58)	F=.01, p=.93, η^2=.01	F=.61, p=.44, η^2=.02	F=2.06, p=.16, η^2=.07
	WL	58.71(9.57)	55.79(7.08)			

Note. † Effect sizes reported are partial eta squared. *p<.05. **p<.01.

Table 5

Means, Standard Deviations and Significant Effects[†] *of Repeated ANOVAs for Anxious Subgroup*

Outcome Variables	Group	Pre-Test M(SD)	Post-Test M(SD)	Group Effect	Time Effect	Group x Time Effect
CBCL *df*(1,23)						
Internalizing	MMA	63.30(9.24)	61.30(9.88)	F=1.04, p=.32,η^2=.04	**F=14.57, p=.00, η^2=.39	F=2.74, p=.11,η^2=.11
	WL	68.20(7.57)	63.13(7.61)			
Total Problems	MMA	61.00(8.51)	59.80(7.91)	F=.53, p=.47, η^2=.02	**F=9.58, p=.01, η^2=.29	F=2.59, p=.12,η^2=.10
	WL	64.53(7.44)	60.73(7.43)			
Social Problems	MMA	62.30(6.38)	59.80(6.43)	F=1.18, p=.29,η^2=.05	**F=12.99, p=.00, η^2=.36	F=.84, p=.37, η^2=.04
	WL	66.93(10.7)	62.73(9.46)			
Affect Problems	MMA	65.20(9.34)	63.90(9.32)	F=.13, p=.72, η^2=.01	F=3.49, p=.08, η^2=.13	F=1.05, p=.32,η^2=.04
	WL	68.00(8.36)	63.53(9.14)			
Anx/Depressed	MMA	62.30(7.41)	60.10(7.74)	F=1.82, p=.19,η^2=.07	**F=11.97, p=.00, η^2=.34	F=2.95, p=.10,η^2=.11
	WL	68.40(8.40)	61.87(7.43)			
Anxiety	MMA	62.80(7.70)	61.20(8.25)	F=1.31, p=.26,η^2=.05	**F=8.25, p=.01, η^2=.26	F=2.60, p=.12,η^2=.10
	WL	68.47(7.68)	62.40(8.82)			

YSR *df*(1,58)						
Internalizing	MMA	58.64(11.6)	49.64(8.29)	F=.22, *p*=.65, η^2=.01	**F=14.87, *p*=.00, η^2=.51	F=1.23, *p*=.28,η^2=.05
	WL	58.87(11.3)	53.13(11.2)			
Total Problems	MMA	59.36(8.81)	50.45(8.42)	F=.13, *p*=.72, η^2=.01	**F=33.89, *p*=.00, η^2=.56	F=1.22, *p*=.28,η^2=.05
	WL	59.33(11.6)	53.27(11.0)			
Social Problems	MMA	59.45(8.91)	55.36(5.66)	F.09, *p*=.77, η^2=.00	*F=13.47, *p*=.00, η^2=.36	F=.26, *p*=.62, η^2=.01
	WL	61.00(9.99)	55.60(6.93)			
Affect Problems	MMA	61.00(8.16)	55.45(6.98)	F=.02, *p*=.89, η^2=.00	**F=12.96, *p*=.00, η^2=.35	F=.15, *p*=.70, η^2=.01
	WL	60.07(9.22)	55.60(5.83)			
Anx/Depressed	MMA	60.18(8.93)	53.36(4.25)	F=.11, *p*=.74, η^2=.01	**F=11.84, *p*=.00, η^2=.33	F=2.38, *p*=.14,η^2=.09
	WL	59.00(9.38)	56.40(7.08)			
Anxiety	MMA	61.00(5.95)	54.27(4.43)	F=.04, *p*=.84, η^2=.00	**F=15.73, *p*=.00, η^2=.34	*F=7.65, *p*=.01, η^2=.24
	WL	57.73(8.54)	56.53(6.48)			

Note. † Effect sizes reported are partial eta squared. *p<.05. **p<.01.

Figures

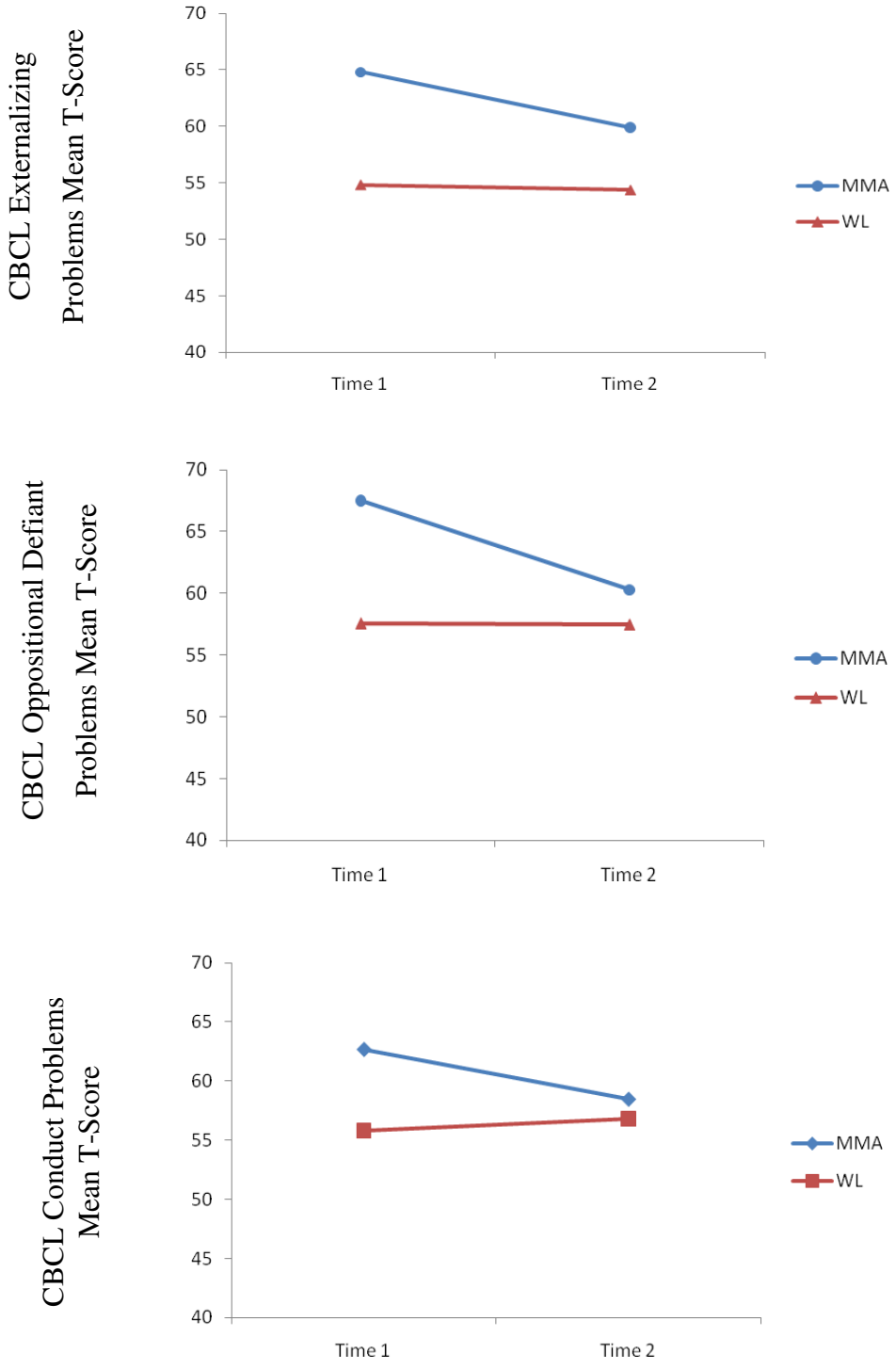

Figure 1. Changes in parent-rated externalizing symptoms (top panel), oppositional defiant problems (middle panel), and conduct problems (bottom panel) in a sample of adolescents with comorbid LD/ADHD diagnoses.

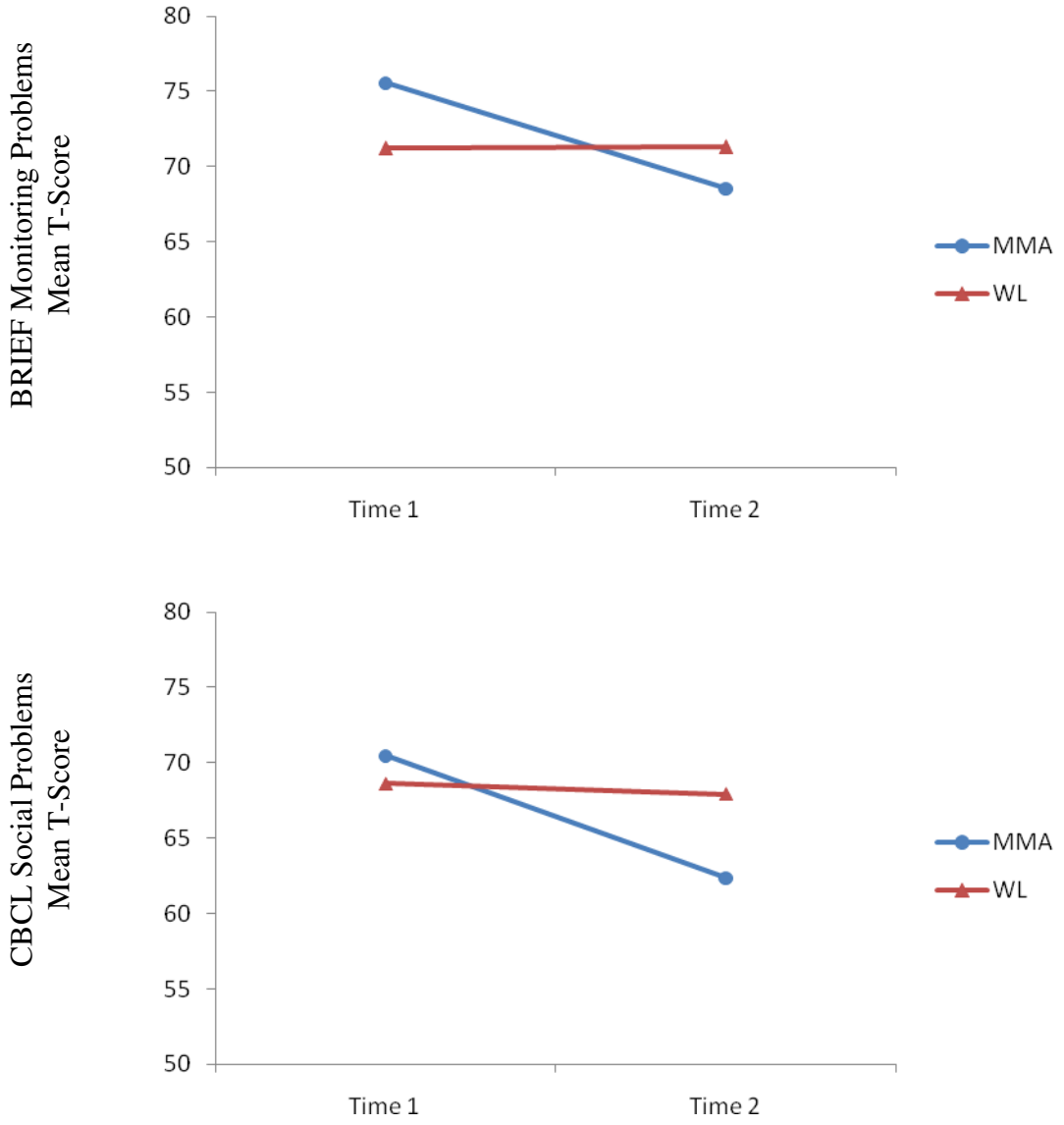

Figure 2. Changes in parent-rated monitoring difficulties (top panel) and social problems (bottom panel) in adolescents with hyperactive/impulsive symptoms.

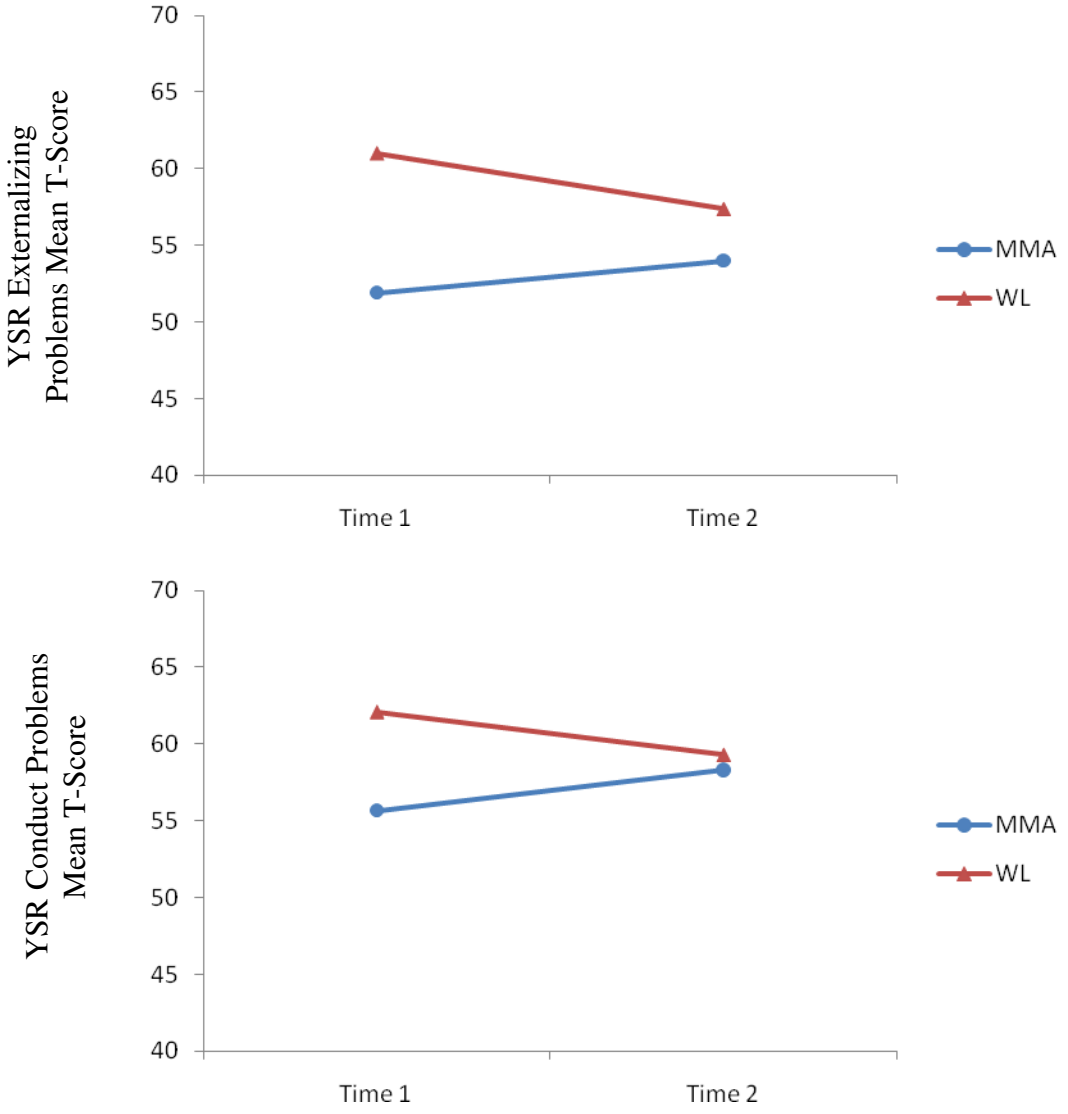

Figure 3. Changes in self-reported externalizing behaviour (top panel) and conduct problems (bottom panel) in adolescents with hyperactive/impulsive symptoms.

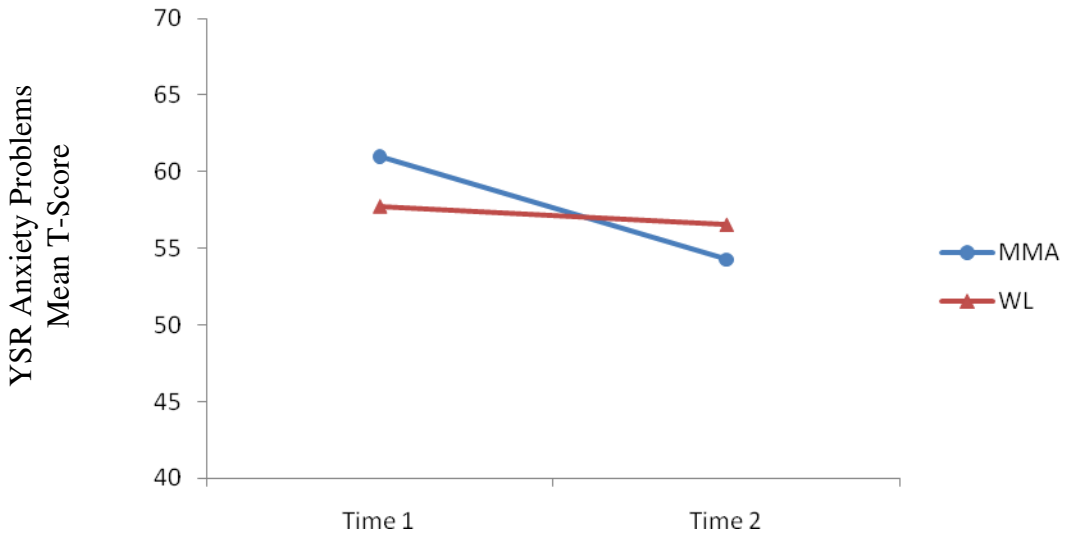

Figure 4. Changes in self-reported DSM anxiety symptoms in a sample of adolescents with high levels of parent-rated anxiety symptoms.