2019

Effects of Mindfulness Practice on the Academic, Cognitive, and Psychological Outcomes of First and Second Language Learners: A Literature Review

Tami L. Noblet
Bethel University

EFFECTS OF MINDFULNESS PRACTICE ON THE ACADEMIC, COGNITIVE, AND PSYCHOLOGICAL OUTCOMES OF FIRST AND SECOND LANGUAGE LEARNERS: A LITERATURE REVIEW

A MASTER'S THESIS

SUBMITTED TO THE FACULTY

OF BETHEL UNIVERSITY

BY

TAMI NOBLET

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

MASTER OF ARTS

AUGUST 2019

Acknowledgements

I would like to express my deepest appreciation to my thesis advisor, Dr. John Bergeland, for his endless support and invaluable feedback throughout the entirety of the thesis writing process. I would also like to extend my sincere gratitude to my second reader, Dr. Lisa Silmser, for her time and constructive guidance in adding final revisions. A special thanks to my dear friend, Vicky Maharaj, who introduced me to the healing powers of yoga meditation when I needed it most and to my family and friends for offering much needed support. Lastly, I'd like to recognize the Bethel University Library staff for providing assistance in my thesis research and to my local Caribou baristas for providing a quiet and friendly space for my countless hours of research, reading, and typing.

Abstract

The purpose of this literature review on Mindfulness and metacognitive studies conducted in a school setting between 1983-2018 was twofold. The first was to investigate the effects of mindfulness on the academic, cognitive, and psychological outcomes of students in a school setting on the general student population as well as language learners. The second was to compare the effectiveness of various mindfulness techniques. In the majority of the studies, mindfulness, particularly Transcendental Meditation (TM), positively impacted student academic, cognitive, and psychological outcomes. Overall, this analysis supports the incorporation of routine mindfulness practice in any school curriculum.

Table of Contents

List of Tables

CHAPTER I: INTRODUCTION

The practice of mindfulness is by no means a new phenomenon, yet it has only recently been implemented and studied in the context of western cultures and schools. Mindfulness or meditation are often used in order to reduce stress and become more in tune with one's inner thoughts and feelings. It is generally accepted that practicing mindfulness techniques (e.g. slowing one's breathing and focusing on the breath) leads to a greater feeling of calm (Ackerman, 2017). However, few studies have investigated the effects of mindfulness instruction on academic performance, specifically regarding second language learners.

In this literature review, I undertake an investigation of the following five questions: 1) What effect does mindfulness instruction have on the academic performance of second language (L2) learners? 2) What are the comparative effects of mindfulness instruction between L2 learners and non-L2 learners? 3) Which mindfulness techniques are most effective in improving academic performance of both L2 and non-L2 learners? 4) How do mindfulness and meta-cognition relate in regards to academic studies? 5) How does mindfulness instruction influence the use of meta-cognitive strategies in both L2 and non-L2 learning?

I chose this research topic in order to combine two aspects of life and education that are relevant and important to me and our present society. As more and more students with native languages other than English emerge in our schools, it becomes increasingly important to identify potentially new and/or improved ways to ensure these students can be academically successful. As anyone who has attempted to learn a second, third, or more language(s) well knows, language learning can be daunting, especially when attempting to acquire the language while simultaneously learning in the L2. Prominent English language (EL) research notes an

important factor in students' ability to acquire a new language is the affective filter; that is, the level of comfort or stress a student feels towards speaking in a given environment (Fallah, 2016; Horwitz, Horwitz, & Cope, 1986; Onwuegbuzie, Bailey, & Daley, 2000; Sharkey & Layzer, 2000). Mindfulness and metacognitive instruction alone may not be the single most motivating factor in effective second language acquisition (SLA). However, this literature review seeks to identify the effect and magnitude mindfulness practice can have on both L2 and non-L2 learners' academic success in school.

Definitions

Throughout this literature review, I frequently reference several terms and acronyms; most terms will relate either directly to language learning or mindfulness practice. Here is the list of language terms: English language (EL), foreign language (FL), English as a foreign language (EFL), second language (L2), and first language (L1). L1 refers to the language a person learned naturally from birth as it was the first language to which the individual was exposed and began to speak. L2 refers to any subsequent language(s) that is learned after having acquired a primary language (L1). In this context, L2 may signify a true second language, as well as any additional (e.g. third, fourth) languages a person may acquire. Foreign language (FL) refers to any language a person learns or speaks as an L2 while in a country where that particular language is not identified as a native language for its population. For instance, a student learning to speak German at a public high school in Minnesota would be learning German as a FL. Additionally, EFL refers to an L2 learner studying the English language outside the context of a native English speaking country.

As for mindfulness, renowned expert Kabat-Zinn (2005) stated, “Mindfulness is none other than the capacity we all already have to know what is actually happening as it is happening” (p. 109). In this regard, mindfulness is something that anyone can do, but it must be intentionally cultivated. Specifically, Kabat-Zinn further explained mindfulness is “a moment-to-moment, non-judgmental awareness, cultivated by paying attention in a specific way, that is, in the present moment, and as non-reactively, as non-judgmentally, and as open-heartedly as possible” (p. 108). Simply put, being mindful is the act of intentionally paying attention to one’s self and one’s surroundings at the present moment, without placing value to one’s observations. Comparatively, Merriam-Webster Dictionary (2019) defined metacognition as the “awareness or analysis of one’s own learning or thinking process.” In this vein, both mindfulness and metacognition are closely related. Both require intentional awareness of one’s thoughts; however, mindfulness also encompasses awareness of emotions, thoughts, and outside experiences, whereas metacognition focuses solely on the awareness of thought processes. As a result, metacognition can be classified as a subcategory of mindfulness.

Mindfulness Intervention Programs

The studies in this literature review implemented several different forms of mindfulness intervention programs including: Transcendental Meditation (TM), Mindfulness-Based Stress Reduction (MBSR), Paws b, Call to Care-Israel (C2C-I), MindUP, Quiet Time, and yoga. Initial TM training is delivered by a certified TM instructor from the TM foundation. An email from Beth at the TM foundation to the author, explained that the initial training for TM lasts four consecutive days. Subsequent TM practice is continued on an individual or class level with guidance from the students’ regular classroom teacher and follow-up meetings are held to check

practice with the TM instructor. See Table 1 in the Appendix for a detailed description of the seven-step initial training for TM.

MBSR was created by Kabat-Zinn (1979) at the University of Massachusetts (UMASS, 2017). MBSR is an eight-week course, which integrates stress science and physiology to restore a sense of balance in an individual (Bakken, 2019). MBSR uses several different mindfulness practices in order to achieve this goal; yoga, guided meditation, body stretching, and mindful communication. Quiet Time is a TM program designed by the David Lynch Foundation (2019), which provides TM training for at-risk populations including schools, veterans, survivors of sexual assault, people with HIV, and incarcerated individuals. Quiet Time is available to these individuals living in Los Angeles, CA, Chicago, IL, and Washington D.C. in the United States, as well as parts of Africa and Jamaica.

Paws b is an alternative mindfulness program offered for school children, specifically in the UK through the Mindfulness in Schools Project; though individuals interested in teaching mindfulness to middle school or high school students may alternatively attend online training through the organization's '.b' program. The Mindfulness in Schools Project (2019) explained that Paws b is specially designed for children ages 7-11, while .b teaches mindfulness practice to students ages 11-18. While both Paws b and .b curricula are designed to teach students about and how to practice mindfulness, the major difference is the consideration of age group in the length and delivery of each lesson; Paws b contains twelve 30-minute lessons for younger students and .b lessons contains ten 40-60 minute lessons for middle and high school aged students. Classroom teachers interested in teaching Paws b or .b to their students take an initial eight-week course to learn mindfulness themselves, then practice mindfulness on their own for two to three

months before they can become qualified to instruct children in the mindfulness curriculum. The goal of the mindfulness curriculum is to teach students to use focused attention and noticing of the present moment, instead of stressing about things that happened in the past or that may happen in the future.

Another mindfulness program, Call to Care - Israel (C2C-I), is a legacy program of the Mind Life Institute. The Mind Life Institute (MLI) was developed in 1987 by three individuals: Tenzin Gyatso (the 14th Dalai Lama), Adam Engle (a lawyer and entrepreneur), and Fransisco Varela (a neuroscientist) to merge the practices of science technology and contemplative meditation so as to "advance progress in human well-being" (Mission section). C2C-I is a socio-emotional learning program developed in 2013 under MLI to promote contemplative practice through mindfulness and compassion exercises. C2C is currently available in the United States, Bhutan, Israel, and Vietnam (Programs and Events section).

MindUP is a part of the Goldie Hawn Foundation (2018); it is a school-wide mindfulness program geared to address socio-emotional issues during childhood (e.g. anxiety, depression). MindUP was developed in 2003 to help students cope with stress and to better manage their emotions through the practice of "optimism, resilience, and compassion" (About Us section).

Yoga has been described as "a profound meditation practice, especially when practiced mindfully, and develops strength, balance, and flexibility of mind even as it is developing those same capacities at the level of the body" (Kabat-Zinn, 2005, p. 273). According to the author, the key elements of yoga are breath and body awareness. It entails moving the body into various configurations while simultaneously focusing on one's breathing and breath quality.

Alternatively, in the Mindful Movement program students practice movement exercises related to academic learning, such as body movements that mimic letters of the alphabet.

Study Outcomes and Significance

Frequently used terms regarding study outcomes and their significance include: State Trait Anxiety Inventory (STAI), California Standards Test (CST), p-value, and Cohen's D. According to Spielberger and Spielberger (2010), the State-Trait Anxiety Inventory is a 20-question Likert-scale assessment used to identify both a person's emotional state during specific scenarios (S-Anxiety) and general emotional tendencies (T-Anxiety). Depending on the needs of the researcher, results can be viewed individually or as a combined score for state and trait anxiety. Another frequently used assessment in this review is the California Standards Test (CST). According to the California Department of Education (2015), the CST is a statewide assessment used in California (USA) which uses a scaled score (ranging from 150-600) to allow individual and group comparisons of student academic performance from year to year. The five CST performance levels are advanced, proficient, basic, below basic, and far below basic.

Regarding statistical analysis, the p-value and Cohen's d are often used in educational research. P-value provides readers with the probability that outcomes are due to a study's intervention and not random chance (Kim, 2018). The threshold for statistical significance in most studies is either .05 or .01; for the present study a p-value of .05 or less is considered statistically significant. Although the p-value is commonly used within educational research, there has been some criticism as to its accuracy in studies with large sample sizes, so I also used Cohen's d to measure statistical significance throughout this analysis. While the p-value demonstrates statistical significance against the null-hypothesis (outcomes being due to random

chance), Cohen's d measures an outcome's effect size, or the degree to which an outcome is affected by the intervention (Harlow, 2018). Cohen's d effect sizes are measured at 0.2 (small), 0.5 (medium), and 0.8 (large). Effect sizes lower than 0.2 are considered non-significant and effect sizes greater than 0.8 are considered highly significant.

Grade Levels and Academic-Related Outcomes

For the purposes of this review, student grade levels and categories of academic-related outcomes are as follows: Kindergarten (4-6 years of age), primary school (grades 1-8, 6-14 years of age), secondary (grades 9-12, 15-18 years of age); and university (undergraduate, 18-31 years of age). Academic outcomes include student grades in individual courses, gpa scores, teacher reports of academic performance, state standardized test scores, and performance tests measuring state academic standards. Cognitive outcomes include standardized tests measuring student executive function and other non-academic intelligences. Psychological outcomes include tests measuring emotional intelligence, anxiety, behavioral ratings, and student well-being.

Summary

In Chapter One, I outlined the purpose of this review, which was to investigate the effects of mindfulness practice on the academic-related outcomes of both L1 and L2 students in a school setting. I also provided definitions of the language and mindfulness terms that frequently appear in this review. In Chapter Two, I provide a detailed description of 27 empirical studies and two meta-analyses that investigated the effects of mindfulness and metacognition practice on student academic performance (academic, cognitive, and psychological) in school.

CHAPTER II: LITERATURE REVIEW

The studies included in this review range from Kindergarten to the university level. The analysis originally targeted K12 studies, but later expanded to include three university level studies, to gather further data on second language learners (Fallah, 2017) and academic outcomes related to mindfulness (Hanley et al., 2015) and metacognition (Jaafar & Ayub, 2010). Only empirical studies using a mindfulness intervention or survey method and conducted within a school setting were included in the analysis, though the settings varied greatly due to location and school grade levels. Studies with fewer than ten participants were excluded from the analysis. Only studies with titles and descriptions explicitly matching the search parameters were further investigated prior to consideration for inclusion. Both keyword catalogue search and grandfather search methods were used to identify relevant studies for this review; articles available through the Bethel University library online catalogue were used in the study and relevant articles referenced in the present online searches were also utilized for this review.

Databases in the Bethel University online catalogue and accessed primarily for this literature review include: Gale Cengage Educator's Reference Complete, Elsevier ScienceDirect Journals, EBSCOhost PsychARTICLES, Gale Cengage Expanded Academic ASAP, SAGE JOURNALS Deep Backfile 2018, SAGE JOURNALS Premier 2019, SpringerLink Journals Complete, Education Database, and EBSCOhost MegaFILE. In addition to grandfather searches of studies selected for review, thesis projects of former Bethel University students were also included in the search. Primary keywords used to identify prospective empirical research were as follows: mindfulness, meditation, academic achievement/performance, second language learners, ESL, yoga, and education. In order to be included in the final data for this literature review,

empirical studies must have used some form of mindfulness measure and provided information on cognitive or academic measures (including student stress and anxiety levels, as these can be related to academic achievement in students), and studies must have been related to students in an academic setting (preschool to university level students).

Narrowing Process

My analysis first began with a keyword search for empirical studies of mindfulness interventions on academic performance of second language learners in a K12 setting; no relevant studies were found. I then expanded the search to include general K12 students in empirical studies of mindfulness interventions on academic performance; 15 studies met this criteria. Eight of these studies included either gpa or specific subject grades for students (Anila & Dhanalakshmi, 2016; Bakosh et al., 2015; Butzer et al., 2015; Franco et al., 2010; Kauts & Sharma, 2009; Lu et al., 2017; Schonert-Reichl et a., 2015; Wendt et al., 2015) and seven other studies included academic standardized test scores or non-grade teacher reports of academic performance (Beauchemin et al., 2008; Bennet & Dorjee, 2015; Harpin et al., 2016; Nidich et al., 2011; Shoval et al., 2018; Telles et al., 2013; Thomas et al., 2016).

As I needed additional data, I again expanded the search to include standardized cognitive test scores of intelligence and executive function (Tower of London and Visual Motor Inventory) (Rangan et al., 2008; So & Orme-Johnson, 2009; Spillios & Janzen, 1983; Tarrasch et al., 2017; Vickery & Dorjee, 2016). Once more, I expanded the search to include mindfulness studies with psychological outcomes, which exhibited similar qualities to previously included studies. Elder et al. (2011) used a TM intervention and measured two psychological outcomes (anxiety and mental health) that overlapped with ten other mindfulness studies measuring

cognitive and academic outcomes already selected for review (Anila & Dhanalakshmi, 2016; Beauchemin et al., 2008; Bennet & Dorjee, 2015; Franco et al., 2010; Schonert-Reichl et al., 2015; So & Orme-Johnson, 2001; Spillios Janzen, 1983; Tarrasch et al., 2017; Vickery & Dorjee, 2016; Wendt et al., 2015). Finnan (2014) was a qualitative study included in the review for its analysis of yoga's perceived effect on academics as reported by teachers and students, but was discluded from the statistical analysis, due to the qualitative nature of the study. Ehud et al. (2010) also included psychological outcomes only, but was included due to the similarity in outcomes measured and its potential to provide insight into mindfulness' effect on refugee L2 learners in the United States, as the study investigated the effects on 122 primary students after the Second Lebanon War.

I expanded the search one final time to include two university studies; one, which measured foriegn language anxiety of EFL Iranian students at the University of Zabol (Fallah, 2017), and the other, which measured the academic self-efficacy of 243 non-L2 university students. Two metacognition studies, Jaafar and Ayub (2010) and Van De Kamp et al. (2015) were included in addition to the Lan et al. (2014) meta-analysis to serve as a comparison to the meditative mindfulness studies (yoga, meditation, mindful movement), but are not exhaustive, as these studies were not the primary focus of this review. The metacognition studies and meta-analysis were included due to their similarity in outcomes measured to the mindfulness studies selected for the review (cognitive and academic) and relatively large sample size (N = 104 & 203). Related studies not in this review include: Frumos (2015) due to lack of participant information, Wagener (2016) due to individualized quiz scores rather than overall course grades or gpa, and Kukreja, Saini, and Vig (2014) due to the study focusing on gender comparisons to

metacognition and academics. Based on this review's focus on mindfulness meditation's effects on academic performance, one metacognition review, which closely matched in population and outcome type was selected for inclusion in this review; namely Jaafar and Ayub (2010) investigated academic outcomes of 203 university math students, Van De Kamp et al. (2015) investigated cognitive outcomes of 104 16-17 year old students attending an art class, and Lan et al. (2014) conducted a meta-analysis of 17 metacognition studies regarding reading comprehension outcomes, with two studies having L2 participants. A metacognition study on psychological outcomes was not included, because this review seeks to investigate the academic outcomes of mindfulness interventions.

Article Selection

All of the articles relate some type of academic-related measure to a form of mindfulness measure and include grade levels kindergarten through university (age range = 4-31 years). Twenty-five articles explicitly investigated student performance in regards to some form of mindfulness measure and two articles investigated the effects of metacognition interventions on academic related outcomes. Of these studies, 11 evaluate academic-related performance outcomes to meditation-only practice, 11 evaluate academic-related performance to yoga or mindful movement practices, three provided no intervention (but measure student mindfulness levels and academic-related performance), and two systematic reviews of mindfulness and metacognition studies on academic performance conducted by Lan, Lo, and Hsu (2014) and Maynard, Solis, Miller, and Brendel (2017) are included in this review. Two final empirical metacognition studies on cognitive and academic outcomes were also included.

The two meta-analyses were included in order to provide a comparison to the present review in terms of intervention effectiveness and magnitude. The Campbell Collaboration meta-analysis reviewed 61 studies related to mindfulness in schools, while the metacognition meta-analysis provides specific data on computer-based metacognition intervention, which was not investigated in the other metacognition studies (Lan et al., 2014; Maynard et al., 2017;). Schonert-Reichl et al. (2015) is the only study in this review which also appears in Maynard et al. (2017). Another study conducted by Bakosh, Snow, Tobias, Houlihan, and Barbosa-Leiker, (2015), which appears in Maynard et al. (2017) was discluded from the present review, because a more recent study by Bakosh et al. (2018), which followed a similar design and procedure was included in the present study instead. Significant differences between the present study and Maynard et al. (2017) are the presence of TM studies and the time of publication. TM studies were included in this review, but explicitly excluded from Maynard et al. (2017) due to the belief that TM is a religious practice; although, according to Nidich et al. (2011), TM practice is not related to or dependent upon religion. Three other studies analyzed by Maynard et al. (2017), which measured academic achievement outcomes to mindfulness interventions were also discluded from the present review, for because they were not available through the Bethel University catalog search (Flook, Frank, & McEachern, n.d.; Smith, Cunnington, McQuillin, & Crowder Bierman, n.d.; Wick, 2013).

Academic-related outcomes were measured for a total of 637 second language learners (five studies), including English L2 learners, EFL learners, and FL learners. L2 students across the studies ranged from primary to university level (age=9-31; grade level=4-undergraduate) and study type included TM and other meditation-only interventions, as well as mindfulness survey

without intervention. For a full outline of the statistical outcomes across studies, refer to Table 2.1 in the Appendix.

Chapter Two is divided into four main sections: 1) Mindfulness without Movement Intervention, 2) Mindfulness with Movement Intervention, 3) No Intervention, and 4) Metacognition Intervention.

Mindfulness without Movement Intervention

This section of the literature review includes 11 studies relating mindfulness meditation interventions in a school setting, which do not incorporate any movement element as part of the intervention. Subjects in the TM studies comprised 867 students (189 primary and 678 secondary) and other mindfulness interventions comprised 495 students (400 primary and 95 secondary). A total of 123 second language learners (62 EL; 61 FL) were included within three of the meditation studies; 28 L2 learners participated in the TM study, while 95 L2 learners participated in other mindfulness meditation studies. Countries included in the non-movement literature review span the USA, UK, India, Taiwan, Canada, Spain, Wales, and Israel; one article did not specify the location. Programs included in this review are TM, MindUP, Paws-b, Call-to-Care-Israel (C2C-I), relaxation therapy, and a mindfulness meditation program. See the definitions' section in Chapter One for overviews of each intervention type.

Transcendental Meditation

The official site of the Transcendental Meditation (TM) technique, Maharishi Foundation USA (2019), stated TM is an effortless technique that improves "creativity, clarity of mind, and practical intelligence" (section What is the TM Technique?, para. 2). As for mindfulness only interventions, four articles (six original studies) included the explicit use of TM as an

intervention measure that assessed the academic and/or cognitive outcomes of 189 primary and 678 secondary school students. Each of the articles used the standard seven-step process and stated the TM intervention had been taught by trained TM instructors. Three of the studies (that were conducted in the United States) included TM practice as part of a school initiative called Quiet Time, while the final study (conducted in Taiwan) implemented TM as a part of the regular school curriculum.

Elder et al. (2011) investigated the effects of TM on the psychological outcomes of a group of 106 secondary students (mean age = 16.64 years; 68 TM, 38 control) in three U.S. states (Connecticut, South Dakota, and Arizona) over a four month period. The TM intervention was practiced twice daily in the morning and afternoon for 10-15 minute sessions after the initial seven-step training. Students were chosen from urban school settings in Connecticut (one school, primarily African-American minority) and Arizona (two schools, primarily Hispanic minority) and a rural school setting in South Dakota (one school, primarily Native American minority). Selection for participation was done through student volunteering; the TM intervention was conducted through the schools' QT program. Students not participating in the TM intervention group spent the same time period doing “other quiet activities in their seat such as resting, sitting quietly, reading, or working on homework” (p. 110). The researchers noted that while control students were engaging in quiet activities, they were not taught the TM method.

Three separate measures were used to assess students’ psychological outcomes in a pre-/posttest manner: 1) Strengths and Difficulties Questionnaire (SDQ), 2) Spielberger State-Trait Anxiety Inventory for Children (STAI-C), and 3) Mental Health Inventory 5 (MHI)-5. The SDQ measure assessed student “psychological distress, or negative affect” and employed self-

reporting via a Likert scale. The STAI-C measure assessed student anxiety levels and includes a Likert scale as well. The full assessment was not administered, because researchers were interested only in students' general anxiety levels, so "only the trait anxiety scale" (p. 111) was used. Lastly, the MHI-5 measure assessed students' "overall mental health and depressive symptoms" (p. 112) using a Likert scale. Statistically significant improvements were found in the TM group in both SDQ ($p < .01$, $d = .51$) and STAI-C ($p < .05$, $d = .42$) measures and improvement, but not statistically significant improvement in TM students on the MHI-5 measure. After TM practice, the intervention students had significantly reduced psychological distress and anxiety levels.

Wendt et al. (2015) investigated the effects of TM on academic achievement and psychological outcomes of a group of 195 ninth grade secondary students, 28 of which were EL learners (124 TM, 53 control), from two schools in the same school district over a seven month period. The TM intervention was practiced twice daily in the morning and afternoon after the initial seven-step training period. Students were selected for study participation via volunteer recruitment; intervention-control status was split between schools, with one school serving as the intervention group and the other school as the control. At the intervention school, students were invited to "attend an introductory talk and a question answer session on the practice and benefits of TM" (p. 313). The school selected as the intervention school utilized the TM intervention as part of the school's regular QT practice. At the control school, researchers invited students to be a part of a study focusing on psychological and academic achievement outcomes.

Methods were split between psychological (5) and academic (3) measures in regards to TM intervention. Psychological measures included: 1) Profile of Moods (POMS), 2) STAI-C, 3)

Resilience Scale, 4) Self-Control Scale, and 5) Bar-On Emotional Quotient Inventory (BAR-On); while academic measures included: 1) Instruction Time, 2) English Language Arts (ELA) on the California Standards Test (CST), and 3) Grade Point Average (GPA). The POMS assessed student positive and negative moods using a Likert scale. The STAI-C assessed student anxiety levels, both general and environmental specific levels, using a Likert scale. The Resilience Scale assessed students "emotional capability to cope with stress and adversity" (p. 314) with a Likert scale. Self-Control was measured similarly using a Likert scale; it assessed students' self-control and resiliency levels. The Bar-On measured "emotional and social functioning" (p. 315) among students with a Likert scale. As for academic measures, instruction time was measured as a "percent of time the student received instruction and is equivalent to class attendance" (p. 315). ELA scores were measured based on the CST, which assesses students' proficiency regarding academic standards set by the state of California. Finally, GPA was determined based on final grades for the fall and spring semesters of the 2012-2013 school year.

Regarding statistical outcomes from the study, Wendt et al. (2015) found statistically significant differences in resilience ($p < .05$, $d = .44$) and anxiety levels ($p < .05$, $d = -.59$) for between group comparisons. Specifically, students in the TM intervention group saw significant decreases in anxiety levels and higher levels of resilience compared to the control group. The researchers found statistically significant differences between the control and intervention groups at baseline and used "an analysis of covariance (ANCOVA)" (p. 315) in order to adjust for differences in the study's outcomes.

Nidich et al. (2011) investigated the effects of Transcendental Meditation (TM) practice on the academic outcomes of 189 sixth through eighth grade students (125 TM, 64 control) at a

single middle school over a four month period. The TM intervention was practiced twice daily in the morning and afternoon for 10-15 minutes each session. Sixth and seventh grade students served as the TM intervention groups and eighth grade served as the control group. The researchers noted the majority of students at the selected school predominantly had a minority background and low socioeconomic status. Additionally, the selected school "was in the lower half academically of all district middle schools" (p. 557). The TM group engaged in the TM intervention during the school's regular QT program and was administered over a three month period before the post-measures were assessed. All students participating in the study were below grade-level proficiency based on the California Standards Test (CST). A subgroup of 100 total participants was created within the study. These control and intervention students were "matched on both math and English performance level scores" (p. 557); all students in this subgroup were below grade level proficiency in both math and English .

Measures included the California Standards Test (CST) as an overall score and individualized scores in math and English from the CST. California utilizes the CST to assess student grade level proficiency, similar to other state standardized tests used in the United States. This measure was recorded as a baseline from students' previous year of school and as a posttest upon completion of the TM intervention. Statistically significant improvements were found in all three measures for TM students ($p < .01$) compared to controls; specifically, CST composite ($d = .75$), math ($d = .82$), and English scores ($d = .44$). Additionally, a higher proportion of TM students made a one performance level increase or more on the CST scaled score than controls. Specifically, 40.7% of TM "students gained at least one performance level in math compared to 15.0% of the non-meditating control students" (p. 559). Regarding English, 36.8% of TM

students improved one level or more, while control students saw the same gains at a rate of 17.2%. Both the overall and subgroup data of 100 ability-matched students between the control and intervention group had congruent findings; namely, intervention students made statistically significant improvements on the math, English, and composite scores for the CST. Based on Cohen's d, intervention students had highly significant improvements in math and composite CST scores and a moderately significant improvement in English.

So and Orme-Johnson (2001) investigated the effects of TM on cognitive measures in three separate studies of secondary and vocational school Chinese students in Taiwan. Each of the experiments contained at minimum a TM intervention, no treatment control, and followed a pretest-posttest format. While each of the studies followed similar measures and procedures, some differences were present between the three studies.

Experiment one included a six month study of 154 secondary students (mean age = 16.5 years), attending four separate classes within a single senior high school in the mid-northern region of Taiwan over a six month period. The experiment followed a pretest-posttest format; students were invited to attend the regular TM introductory lecture and then divided between students interested in learning the technique and those not interested. Students interested in learning TM were then randomly divided into the TM intervention group (n=56) and a waitlist control napping group (n=58); students uninterested in TM were utilized as a non-interest control group (n=40) The school in experiment one provided all students with a regular 30 minute break at the start of each school day, so 20 minutes of this time was utilized for implementing the TM intervention. Students in both the waitlist control and the non-interest groups remained in their respective classrooms and used the time for napping, while the TM group meditated in the

hallway. Students practiced or napped at school daily in the morning and were instructed to continue their second meditation practice at home each day. Teachers reported that "over 85% of the students followed the schedule regularly" (p. 426).

Experiment two included a six month study of 118 female students (mean = 14.6 years of age) from three different classes within a single junior high school in Taipei, Taiwan. Experiment two also had three groups within the experiment: a TM intervention group (n=37), a no treatment group (n=40), and a "comparison group of contemplation meditation" (n=41) (p. 427). Students in experiment two were randomly selected by class to either the TM or non treatment group. The contemplation group was added to the study due to another school teacher's interest in meditation. The contemplation students learned the contemplation technique over five class sessions, which were taught by the students' regular classroom teacher. The contemplation meditation was similar to TM in that it "was practiced mentally, sitting with eyes closed, and was said to eventually lead the mind to experience the 'Tao,' which equates to 'pure intelligence,' the goal of TM practice" (p. 429). Like the first experiment, the TM and contemplation practices were practiced daily in the mornings at school before the school day and students were instructed to practice at home in the afternoons for 15-20 minute sessions each. Experiment three included a 12-month study of 99 male vocational students (mean age=17.8 years) from two classes at a single vocational school in Tainan, Taiwan. Students were divided randomly by class into a TM intervention group (n=51) and a no treatment control group (n=48). All other methods and procedures were kept the same as in experiment two.

All three experiments used the same measures: 1) Culture Fair Intelligence Test (CFIT), 2) Time Inspection (IT), 3) Constructive Thinking Inventory (CTI), 4) Group Embedded Figures

Test (GEFT), 5) Test for Creative Thinking-Drawing Production (TCT-DP), and 6) State-Trait Anxiety Inventory (STAI). Collectively, the six measures assessed students' levels of cognitive, emotional, and social skills. Cognitive measures used in the studies include the CFIT, IT, measuring reasoning skills and "speed of information processing" respectively, while GEFT "cuts across many dimensions of cognitive functioning, personality and social behavior" (p. 421). GEFT assesses cognitive, personality, and social skills, while TCT-DP assesses "whole-brain activity," and CTI assesses student "attitudes" and "practical intelligence" (p. 421). Anxiety levels of students was assessed using STAI.

Regarding experiment one, So and Orme-Johnson (2001) found when comparing the TM group to the napping group, TM students made statistically significant gains in all but one of the assessments: GEFT, IT, STAI, and CTI ($p < .001$), and TC-DP ($p = .003$); the CFIT measure was nonsignificant. When comparing TM students to the no interest group, students in the TM intervention group exhibited statistically significant gains on all measures: IT, STAI, CTI ($p < .001$), GEFT ($p = .002$), CFIT ($p = .013$), and TC-DP ($p = .005$) (p. 427).

In experiment two, when comparing the TM group to the contemplation group, TM students had statistically significant improvement on five of the measures: 1) TCT-DP ($p < .0001$), 2) STATE ($p < .001$), 3) TRAIT ($p = .002$) 4) IT ($p = 0.46$), and 5) CTI ($p = .004$). The TM students compared to the no treatment group had statistically significant gains on all seven of the study's measures: GEFT ($p = .011$), CFIT ($p = .032$), IT and CTI ($p < .001$), TCT-DP ($p < .0001$), STAI ($p = .016$). When comparing the contemplation and no treatment groups, the contemplation group saw only one variable with statistically significant gains, namely IT ($p = .005$).

Experiment three, had similar results to experiments one and two, namely TM practicing students made statistically significant improvements on all seven variables over the no treatment group at posttesting: GEFT, TCT-DP, STAI, CTI ($p < .001$), CFIT ($p = .035$), and IT ($p = .002$). In experiment three, there was not a third active control as was present in experiments one (napping) and two (contemplation) for further comparison.

Average effect sizes for the three intervention groups combined when compared to the no-interest control groups are as follows: TCT-DP ($d = .77$), CTI ($d = .62$), GEFT ($d = .58$), STATE ($d = .53$), TRAIT ($d = .52$), IT ($d = .39$), and CFIT ($d = .34$). Based on the p and d-values, students in the experimental groups had highly significant improvements in creative thinking, attitude, and practical intelligence on the TCT-DP, CTI, and GEFT; meditating students also saw moderately significant improvements in information processing time and general intelligence on the IT and CFIT outcomes.

Other Mindfulness Programs

Schonert-Reichl et al. (2015) investigated the effects of a meditation program (MindUP) on both cognitive and psychological outcomes of 99 fourth and fifth grade primary students, 34 of which were EL learners, (mean age =10.24 years) in Canada over a 12-week period. Intervention students participated in one 40-50 minute mindfulness lesson per week and researchers encouraged teachers to include three-minute mindfulness practices three times per day for students. Four schools were included in the study (each from a similar, middle-class socioeconomic neighborhood) with a single class from each school eligible for participation. Each classroom was randomized by a coin flip as either control (two schools) or intervention

(two schools). Schools designated as controls continued with their regular school curriculum, while the two intervention schools adopted the MindUP curriculum into the regular school day.

Measures included in the study were as follows: 1) flanker task, 2) hearts and flowers task, 3) saliva cortisol levels, 4) Interpersonal Reactivity Index (IRI), 5) Resiliency Inventory (RI), 6) Marsh's Self-Description Questionnaire (SDQ), 7) Seattle Personality Questionnaire for Children (SPQC), 8) Mindfulness Attention Awareness Scale for children (MAAS-C), 9) Social Goals Questionnaire, 10) peer acceptance, and finally, 11) math end of year grades. The flanker test and the hearts and flowers test were both computer-based programs used to measure students' executive function skills, and cortisol levels were used to assess patterns with aggression. Psychological functions, such as empathy, optimism, and self-emotions were measured using the IRI, RI, and SPQC assessments and mindfulness measures were done using the MAAS-C. School self-concept and social responsibility were measured using the SDQ and Social Goals Questionnaire. Students were also given a questionnaire denoting their likability by peers. Finally, student academic performance was measured based on their final math grades for the school year.

Statistically significant findings were made between groups in the executive and psychological functions. While there was no significant difference between the MindUP and control groups in the accuracy of responses in the flanker test and hearts and flowers test, there was a statistically significant difference between response times for the groups, with the MindUP group having faster reaction times than the control group: flanker switch ($p = .04$, $d = -.21$), incongruent and reverse flanker ($p = .04$, $d = -.22$). The MindUP intervention significantly improved students' capacity to focus and reduce outside distractions. MindUP students also

demonstrated a statistically significant improvement compared to controls in the following: empathy ($p = .03$, $d = .42$), perspective-taking ($p = .04$, $d = .4$), optimism ($p = .02$, $d = .48$), emotional control ($p = .004$, $d = .59$), school self-concept ($p = .02$, $d = .5$), and mindfulness ($p = .006$, $d = .55$), and decreased depressive symptoms ($p = .04$, $d = -.45$). Lastly, while the MindUP children showed a statistically significant higher tendency to "start fights" at pretest compared to control students, MindUP students made significant improvements compared to controls on the majority of the peer-nominated prosocial behavior and aggressive behavior outcomes: sharing ($p = .04$, $d = .42$), trustworthiness ($p = .001$, $d = .76$), helpfulness ($p = .001$, $d = .72$), taking other's views ($p = .001$, $d = .87$), breaks rules ($p = .006$, $d = -.55$), starts fights ($p = .001$, $d = -.71$) and popularity ($p = .05$, $d = .44$). Overall, MindUP students made moderately significant improvements in response time to a stimulus, highly significant improvements in emotional control, mindfulness, trustworthiness, helpfulness, and taking other's views, as well as a highly significant reduction in breaking school rules and starting fights.

An earlier study by Schonert-Reichl and Lawlor (2010), which followed the same procedure with 246 (139 MindUP, 107 C; 63% English L2) 4th-7th grade students from 12 schools, found statistically significant outcomes in optimism (subscale of RI; $p < .05$) and in social and emotional competence in the Teachers' Rating Scale of Social Competence (TRSC) ($p < .001$). Fourth and fifth grade intervention students made statistically significant improvements in school and general self-concept (SDQ), while the sixth and seventh grade intervention students decreased in SDQ measures ($p < .05$). SDQ results for all intervention students combined was non-significant. Positive and negative affect (PANAS) was also measured, but results were non-significant for the intervention students. These results are included as a

comparison to the Schonert-Reichl et al. (2015) study, but Schonert-Reichl and Lawlor (2010) data is excluded from the statistical analysis in Chapter Three due to the presence of the presence of Schonert-Reichl et al. (2015)'s more recent study.

Harpin, Rossi, Kim, and Swanson (2016) investigated the effects of a meditation program combining the MindUP and Mindful Schools curriculums on psychological and cognitive outcomes among a group of 30 fourth grade primary school students in Denver, Colorado, USA. The school was selected due to "an ongoing instructional relationship with one of the investigators" and the two classrooms utilized in the study were selected by the school principal "based on similar student characteristics" (p. 151). While this raises some concern in regards to selection bias, the author does not specify that the school had any previous experience with mindfulness practice, does not further explain the nature of and extent of the author's relationship with the school, and since the intervention was implemented by the students' regular classroom teacher not the author, selection bias is not expected to be a major factor in the study outcomes. One of the classrooms served as the intervention group (n=18) and received mindfulness training over a 10-week period with 20-30 minute mindfulness classes twice weekly during the morning greeting period; while the other classroom (n=12) served as the control and maintained a regular school schedule and curriculum. The meditation intervention utilized in the study was a hybrid of the MindUP and Mindful Schools curricula, two that are commonly used for mindfulness instruction in US schools and taught by certified mindfulness instructors.

Measures used included: 1) Fasttrack Teacher Social Competence (FTSC), 2) Child Assent Mindfulness Measurement Survey (CAMM), and 3) Mindful Schools Survey. According to Gifford-Smith (2000) the FTSC assesses students over the course of one academic year in

academic performance, social skills, and emotion regulation. The CAMM was used to measure students' mindfulness levels, while the Mindful Schools Survey was used to assess student and teacher feelings towards the meditation program upon completion of the intervention.

A statistically significant difference in posttest outcomes for the FTSC ($p = .00$) and positive feelings was reported from the Mindful Schools Surveys (p. 153). According to the Mindful Schools Survey, "100% of [meditating students] said that they 'enjoyed Mindfulness classes,' 'would use Mindfulness again in the future,' and agreed that 'more children should learn Mindfulness'" (p. 153). In addition to the positive feelings towards mindfulness in the intervention group, 75% of these students reported teaching mindfulness techniques to others not included in the study.

Franco, Mañas, Cangas, and Gallego (2010) investigated the effects of a mindfulness program, Meditación Fluir, on the academic and psychological measures on a group of 61 first year secondary students (mean =16.75 years of age) from three separate schools in Almería, Spain. The study used a random controlled trial, and students who had prior experience with meditation were disqualified from participation. Participating students were allocated to either a meditating experimental group (n=31) or a waitlist control (n=30) that received meditation training after the end of the three month experiment. The intervention consisted of a 1.5 hour formal meditation class administered once weekly over a period of ten weeks, with additional daily practice of 30 minutes. The program, Meditación Fluir, is described as a meditation technique that does not attempt

to try and control thoughts or change them or place them with others, but on the

> contrary, just let them alone, and accept any idea that might appear or emerge spontaneously, developing a state of full attention to this mental activity, while being aware that they are transitory and nonpermanent. (p. 86)

Further, the Meditación Fluir uses mantras as well as breath and body awareness as central components of its technique. It is unspecified within the study where the intervention and practice sessions occurred or by whom the intervention was administered.

Measures used included: academic performance, Self-Concept Questionnaire (academic, social, emotional, family, and composite), and STAI. All measures utilized a pre/posttest method. Students' academic performance was assessed by grades in all school subjects (Spanish language (L1), foreign language (L2), and philosophy), and additionally a composite gpa score. Pretest academic scores were accessed through student tutors of students' first-quarter grades of the same year and posttest were accessed again upon completion of the study. The Self-Concept Questionnaire was used to assess student self-awareness in the areas of "academic, social, emotional, and family" (p. 85). The STAI was administered using the Spanish language version (Cuestionario de Ansiedad Estado-Rasgo) and assessed students' general and situational anxiety.

Franco et al. (2010) found statistically significant outcomes for all measures, when comparing the intervention students to controls. When analyzing for effect sizes of variables in the experimental group, Spanish language (L1) ($p = .001$, $d = 1.03$), emotional self-concept ($p = .001$, $d = 1.85$), total self-concept ($p = .001$, $d = 1.63$), and academic performance ($p = .001$, $d = 1.57$) had the largest effect sizes, followed by academic self-concept ($p = .001$, $d = 1.17$) and philosophy ($p = .001$, $d = 1.03$) (p. 90). Significant effect sizes for the remaining outcomes include: foreign language (L2) ($p = .001$, $d = .76$), social self-concept ($p = .003$, $d = .4$), family

self-concept (p = .049, d = .64), STATE (p = .001, d = .43), and TRAIT (p = .001, d = .84). Furthermore, the researchers broke subject data into subgroups based on pretest scores (low, medium, high) for each of the variables measured in the study. When dividing subject data based on these parameters, the effect size for academic performance was largest for "the subgroup with medium academic performance (d=3.05), followed by the subgroup with a high score (d = 2.49)" (p. 91). Regarding self-concept, the largest effect size was evidenced in "the subgroup with the originally low self-concept (d=5.12), followed by the medium score group (d = 2.78)" (p. 91). Lastly, the meditation program benefitted high-anxious students the most, when compared to students with initially low-anxious scores at the outset of the study.

Vickery and Dorjee (2016) investigated the effects of the Paws b meditation intervention on the metacognitive and psychological outcomes of 18 primary school students (mean age = 7.9 years; age range = 7-9 years) from three separate schools in North Wales over a three month period. Schools were included on a voluntary basis. The first two schools that responded as willing participants were allocated to the intervention group (n = 33) and practiced 12 total 30-minute mindfulness lessons and a 5-10-minute additional practice weekly; the third school was allocated to the control group (n = 38). Classroom teachers in the school were trained and implemented the Paws b curriculum to students.

The following five assessments were employed: 1) Child Adolescent Mindfulness Measure (CAMM), 2) Emotion Expression Scale for Children (EESC), 3) Sterling Children's Well-Being Scale, 4) The Positive and Negative affect Scale for Children (PANAS-C), and 5) Behavior Rating Inventory of Executive Function - Teacher and Parent Versions (BRIEF-T/ BRIEF-P). The researchers used the CAMM likert model to measure student mindfulness levels

and the EESC and SCWBS measures both assessed student emotion and "psychological well-being" (p. 4). Similarly, the PANAS-C was used to assess the "emotional expressiveness" (p. 5) of the young students. The BRIEF-T and BRIEF-P were both utilized to assess student meta-cognitive functions related to executive functioning.

In three of the five measures, the experiment groups made statistically significant improvements. First, CAMM scores showed no statistically significant improvements from pre- to post-testing, but they did find a statistically significant improvement in the post-follow up assessment for the intervention group over control ($p < .001$, $d = -.46$). As for the PANAS-C measure, the researchers found "a significant time by group interaction" (p. 8) at follow-up again ($p = .003$), but not at post testing (p. 8). In the PANAS-C measure, the experimental group had lower negative affect outcomes than controls ($p = .001$, $d = .84$). Lastly, there was a statistically significant improvement by time ($p = .02$), time by rater ($p = .03$), and time by group by rater ($p = .01$) in the experimental group compared to controls in both the BRIEF-T and BRIEF-P. Further, the experimental group showed that teacher ratings ($p = .002$, $d = 1.08$) significantly decreased between pre-post assessments, while parent ratings increased ($p = .03$, $d = -.61$), which indicates, according to teacher ratings, the experimental group had significant improvements in their metacognitive abilities.

Tarrasch, Margalit-Shalom, and Berger (2017) investigated the effects of the Call to Care Israel (C2C-I) meditation intervention on the cognitive and psychological outcomes of 216 fourth and fifth grade (age range = 9-11 years; mean age = 10.43 years) Jewish-Israeli primary school students (107 female) from three different schools in Central Israel (Participants section, para. 1). The three schools included in the study were selected due to the schools' interest in the

mindfulness program; with one school volunteering as a random control trial, and the latter two schools serving as waitlist controls (138 meditating; 78 WLC). C2C-I was co-created by experts in mindfulness in Israel, members of the Mind and Life Institute in Virginia (USA), and the Enhancing Resiliency Among Students Experiencing Stress program. The C2C-I is intended "to help children develop mindfulness skills and to cultivate a caring and compassionate school climate between the students, teachers and parents as well as to promote academic achievement and foster ethical behavior" (Intervention section, para. 1). The intervention program took place over a period of seven months, and included 24, 45-minute weekly meetings. The intervention was conducted by C2C-I trained administrators with classroom teachers attending the weekly meetings along with students. The weekly meetings focused on the following three concepts: 1) understanding the necessity of accepting care, 2) learning to cope with difficult situations, and 3) promoting empathy towards those outside one's immediate social circles.

Measures used included both cognitive and psychological assessments. Students' cognitive abilities were measured in the study using the Beery-Buktenica Developmental Test of Visual-Motor Integration (VMI). The VMI measures students' ability to plan, concentrate, and control their visual and motor abilities in order to duplicate a series of geometrical images, which grow more difficult as the student progresses through the task. Tarrasch et al. (2017) assessed students' psychological outcomes using the Spence Children's Anxiety Scale (SCAS), which uses a Likert scale and measures overall anxiety levels. Mindfulness levels were measured using the Five Facet Mindfulness Questionnaire (FFMQ) which is a self-survey that assesses the mindfulness level of students.

Statistically significant improvements were found on all four measures in the C2C-I group when compared to the control: visual, motor, anxiety, and mindfulness ($p < .001$). Both visual and motor control made significant improvements in the C2C-I group compared to control, and both had statistically significant decreases in anxiety levels. Similarly, students in the C2C-I group exhibited statistically significant increases on the FFMQ assessment, measuring mindfulness levels of students.

Spillios and Janzen (1983) investigated the effects of a relaxation therapy method on the academic and psychological outcomes of a group of 36 male primary students (age range = 9.75-12.5) with specific learning disabilities from four different schools (eight classes total) in Alberta, Canada over a six-week period. Experienced relaxation therapy teachers conducted 12 total 20-30-minute intervention sessions twice weekly. Students selected for the present study attended all-day special education classes within the public school setting and were significantly behind their peers in math and language arts. Students included in the study were male, between 9-13 years old, have a full-scale IQ based on the Wechsler Intelligence Scale for Children - Revised (WISC-R), and had no record of social or emotional behavior issues. The students in the study were randomized into one of four groups with two serving as the control and two as the experimental group, receiving the relaxation therapy intervention. Student pretesting proceeded as follows: 1) students received the A-State assessment in a stress-free environment, 2) the A-Trait assessment was administered, 3) students took the A-State assessment again in a stressful environment, 4) the Peabody Individual Achievement Test was given to students. Two teachers with experience in relaxation therapy administered the intervention which lasted a total of six weeks and included two 20-30 minute sessions per week.

Measures included both academic and psychological outcome assessments. The Peabody Individual Achievement Test (PIAT) was used for assessing academic achievement in reading comprehension, math, spelling, and general information and the STAI was used to assess students' general and situational anxiety levels. Additionally, researchers employed the WISC-R to assess the acceptability of the initial randomization of the groups, which was determined initially to have created a bias between groups, and were thus "reformulated" (p. 103) to create the final groupings for the study.

No statistically significant differences were found between control and intervention groups on any of the original study measures. However, when student data was "divided into high and low anxious, some differences between achievements the PIAT were evident" ($p = .02$) (p. 105). Specifically, students with low levels of anxiety had lower post-test scores, but improved significantly on the general information subtest of the PIAT measure. Additionally, "in the A-State calm condition, high anxious students made greater gains on the Mathematics subtest only" (p. 105) with all other subjects having no statistically significant differences.

Beauchemin, Hutchins, and Patterson (2008) investigated the effects of a mindfulness meditation intervention on the academic, psychological, and social skills of 34 students (mean age = 16.61 years, age range = 13-18 years; 39% female) with learning disabilities (LD) who were attending a "private residential school in Vermont specializing in serving students who have a primary diagnosis of LD" (pp. 38-39). Fifty-three percent of the students reported having prior experience with meditation or relaxation therapy. Included in the study were two classroom teachers who received mindfulness meditation training from mindfulness meditation instructors. A pretest/posttest model was employed with the intervention group only and all students

participated on a volunteer basis. The two teachers included in the study received a two-hour initial training on mindfulness meditation, while students received two separate initial training sessions for a total of 45 minutes, which was lead by the mindfulness meditation instructor as well as classroom teacher. The initial student sessions consisted of students sitting with optionally closed eyes while focusing on their breathing. “After successfully developing a sense of calm,” from the breathing meditation, students were then instructed to take “note of their thoughts and feelings as they occur, thereby increasing awareness” (p. 40). After the initial training sessions, classroom teachers then continued with the mindfulness meditation instruction everyday over a period of five consecutive weeks. Sessions were done for the first 5-10 minutes of each class period.

Measures used included a range of academic, psychological, behavioral, and attitudinal assessments.. The Social Skills Rating System (SSRS) was utilized in order “to assess the perceived frequency and importance of behaviors influencing student functioning” (p. 39). The “teacher form contains three sub scales to assess social skills, problem behaviors, and academic performance, whereas the student form focuses solely on perceived social skills” (p. 39). The STAI was utilized to assess both general and situational anxiety levels and finally, an attitudinal evaluation was administered using a Likert scale to assess students’ feelings on “their own focus in class, rate their enjoyment of the intervention, and to assess the likelihood of continuing to use MM on their own” (p. 39).

The researchers found statistically significant improvements on all measures assessed in the study. Students anxiety levels in both state and trait sub scales decreased from pre- to post testing ($p < .05$) and student SSRS scores also showed statistically significant improvement

between pre- and post testing ($p < .05$). Additionally, all subscales (social skills, behavior problems, and academic performance) on the teacher SSRS showed statistically significant improvements between pre- and post testing ($p < .05$). Specifically, students social skills improved, problem behaviors decreased, and academic achievement improved.

Mindfulness with Movement Intervention

This section includes 11 studies published between 2008-2018. Ten of these employed yoga as the intervention (including MBSR), while one used a program called Mindful Movement as its intervention element; both types of intervention incorporated some form of movement alongside a mindfulness element as the intervention technique. All students involved in these studies ranged from Kindergarten to 11th grade (n = 2,225; participants = 4-18 years of age). Specified locations for the studies included the United States, United Kingdom, Israel, and India.

Yoga

Butzer, Van Over, Noggle, Taylor, and Khalsa (2015) investigated the effects of a yoga intervention on the academic achievement of 95 ninth through eleventh grade students from one high school in Massachusetts (USA) over a 12-week period. Students with experience in yoga during the previous semester or who had a medical or psychological disability which would interfere with the study were disqualified from participation. Students were randomly assigned to either the yoga intervention group (n=44) or the control "PE-as-usual" group (n=51) (p. 2). Students in the yoga group followed a yoga program based on Kripalu Yoga in the Schools (KYIS) and lead by two specially trained instructors in the yoga program. Intervention students attended the yoga class in place of their regular gym class two to three times weekly for 35-40-minute sessions. The yoga intervention consisted of "5 minutes of centering and breathing

exercises, 5 minutes for an experiential game/activity, 5 minutes of warming up in basic yoga positions, 15 minutes of additional yoga postures, and 5 minutes of supine relaxation that included body scanning and breathing awareness" (p. 2) with mindfulness interwoven into the intervention. Control students continued regular gym classes, without any instruction in yoga.

GPA scores were obtained as a posttest measure only to assess student academic achievement in relation to the yoga intervention. GPA was used as the sole measure due to the researchers' dissatisfaction with combining academic achievement and psychosocial outcomes in the researchers' previous study on the same subject. As a whole, students in the study had a negative change in academic achievement over the course of the academic year, but there was a statistically significant difference between groups in the rate of change during the intervention period. While the control group continued a steady downward slope over the course of the study, the GPA scores of the intervention group remained constant for the first three-fourths of the study ($p = .03$) before declining at the start of the final quarter of the academic year.

In a related study, Ehud, An, and Avshalom (2010) investigated the effects of a yoga intervention on the emotional outcomes of 122 third (n=28), fourth (n=42), and sixth (n=52) grade students (age range = 8-12 years) from two schools in Safed, Israel. The yoga intervention, "*Here and Now: Yoga in School*" was used in the study and was developed as a means "to reach Israeli schoolchildren who otherwise would have no access to long-term therapeutic modalities" (p. 44) after the end of the Second Lebanon War. All students included in the research comprised the intervention group and were taught by a trained yoga instructor for 13 separate yoga sessions over a four month period; school inclusion in the study was based on individual school principals' permission.

Three adapted questionnaires measuring student emotional outcomes were used in the study: 1) WHO (Five) Well-Being Index, 2) Connors Abbreviated Symptoms Questionnaire, and 3) a satisfaction questionnaire. The Connors Abbreviated Symptom Questionnaire was used in order to identify student behaviors in the classroom. The adapted WHO (Five) Well-Being Index and Conners Abbreviated Symptoms Questionnaire were given to students both pre and posttest, while the satisfaction questionnaire was administered posttest to determine students' acceptability of the yoga program.

General results of the intervention group showed statistically significant improvements on measures of attention span ($p = .024$), restlessness ($p = .001$), and inattentiveness ($p = .033$). Other measures made positive improvements, but non-significant. The researchers conducted a second analysis of data by dividing students by grade and found that while all three grades had statistically significant ($p < .05$) changes from pre-posttest, third and sixth grade students had statistically significant improvements in frustration levels, amount of crying, dramatic mood changes, and explosive outbursts; meaning 3rd and 6th grade students had less of these negative behaviors after the yoga intervention. Alternatively, the fourth grade students had statistically significant declines in these same behavior outcomes; which indicates that 4th grade students had more negative behaviors after the yoga intervention. The authors noted the difference in grade level findings may have been due to the subjectivity of individual teachers making the observations.

Alternatively, Finnan (2015) investigated the qualitative longitudinal effects of a yoga intervention on five primary school classrooms within a single US school over a two year period. The primary school hosted a total of 400 students; classrooms included in the intervention had

approximately 20 students each, but class sizes varied slightly between classrooms and year of the study (approximately 60 students total). During the first two years of the intervention, data was collected from a second, third, and fourth grade classroom and a third and fourth grade classroom during the last two years of the intervention. The yoga intervention followed the Yoga Kidz curriculum and consisted of one 40-minute lesson per week; the third and fourth grade classrooms received 30 individual yoga lessons over the two year intervention period. The Yoga Kidz curriculum focused on six key pillars: physical fitness, emotional fitness, mental fitness, focus, perseverance, and positive relationships. Each yoga session generally included stretching, breathing, standing and seated yoga poses, and ended with relaxation. In addition to the regular Yoga Kidz intervention classes, the curriculum also provided classroom teachers with "yoga snacks" (p. 34) which were designed to help students refocus during regular classroom instruction.

Researchers used a qualitative method to assess student academic and emotional outcomes through observation data collection. Yearly interviews were conducted with all persons involved: classroom teachers, principal, yoga instructors, and students. Audio-recorded interviews were conducted with classroom teachers, yoga instructors, and the principal, while student interviews were recorded via written response. Both intervention and non-intervention classroom teachers participated in an eight-question survey during a 2014 faculty meeting as a means for comparison between intervention and non-intervention classrooms. Key measures regarding student learning outcomes were as follows:

(a) what students learned, specifically focus, perseverance, and positive social relations (b) the learning process and context, (c) what was learned during yoga (through explicit

> teaching and practice) and what carried over into the academic classroom, and (d) important elements of the institutional context. (p. 33)

Major findings of the study were that yoga provided a sense of accomplishment in students, encouraged positive social relationships between peers and between students and teachers, and aided in focus and calmness in the academic setting. The authors provided several anecdotes and observations on each; here are some exemplars. One third grade intervention teacher commented on his students working on difficult yoga poses, "When [students] realize they can and the more they try and the more they're focusing on something and using their breathing, it gives them a sense of accomplishment to accomplish something that when they first looked at it, seemed impossible" (p. 36). Regarding positive social relationships, one student commented positively about her teacher joining the yoga practices as a participant; she noted, "Adults can learn too" (p. 37). Students were also observed seeking confirmation from their peers by "correcting their position to match that of a classmate" (pp. 37-38) and in looking to their classmates before deciding to join in. The yoga practices created a sense of community for students, in which it was safe and acceptable to practice yoga, even when parts of the practice were difficult. Both students and teachers felt that skills learned in the yoga sessions carried over into the regular academic setting. One teacher commented on her relief to practice yoga early in the day to foster a more peaceful learning environment for her students. She noted, "There have been a couple of times this year when we've gone and it's kind of been crazy before we go and then the whole rest of the day is just calm" (p. 38). A student comments on how he uses his yoga practice when preparing for stressful academic tasks, "If you are about to do a test you can take deep breaths. Sometimes it helps you remember" (p. 39). Another student commented on yoga's

utility to help her focus during regular classroom lessons, “When I’m struggling, I try to remember the poses and the breathing to help me pay attention” (p. 39). Lastly, the school principal weighed in on the utility of including yoga instruction, despite the tradeoff of less academic instructional time with students:

> We really thought it was a great tool to give our kids when they’re faced with lives that are normally chaotic and school that might be really stressful because a lot of the work is difficult work, and they might be below grade level and are faced with poor models of anger management at home. If a kid doesn’t know how to do a math problem, we teach them the math problem. If they don’t know how to respond when they feel angry, we typically don’t teach them; we just say go home; you’re suspended for a few days because you can’t be angry here. (p. 40)

Kauts and Sharma (2009) also investigated the effects of a yoga intervention on the academic performance of 800 ninth grade students (age range = 14-15 years; 400 female) from eight public schools in Jalandhar, Punjab, India. Students were grouped into high and low stress level students based on the Bisht Battery of Stress Scale (BBSS) given as a pretest and then divided evenly into the control and experimental group, so that each group had an equal number of high and low stress students. Students in the intervention group participated in a yoga routine for one hour each morning over a seven-week period. The yoga intervention consisted of the following elements: yogasana, pranayama, meditation, prayer, and a value orientation.

Two separate measures were used to assess student stress and academic levels. The BBSS was used as a pretest to identify students with high and low stress for initial placement in the study. Also, an academic performance test was conducted at pre and post testing in both the

intervention and control groups. Academic performance was assessed in math, science, and social studies, as well as in a combined score of the three subjects. Researchers found statistically significant improvements of academic performance scores in combined, as well as individual subjects, for intervention students compared to controls ($p = .01$). There was additionally a statistically significant difference in combined academic performance scores when comparing students with high and low stress ($p = .05$); low-stress students had higher academic performance scores than high-stress students overall.

Rangan, Nagendra, and Bhat (2008) similarly investigated the effects of a yoga integrated education program on the cognitive outcomes of 98 male students (age range = 11-13 years; 49 yoga, 49 control) from two separate schools in India over a one year period. The control school in the study followed a Modern Education System (MES), while the intervention school followed the Gurukula Education System (GES). The GES school used "yogic postures (asanas), voluntary regulated breathing (pranayama), meditation (dhyana), recitation of mantras (japa), yogic prayers, worship (puja) and Yogic games (team games played on Yogic principles)" (p. 62). Students practiced yoga 95 minutes each day, split into 15-30-minute sessions throughout the day. Alternatively, the MES school in the study used "physical exercises, mathematical puzzles, music, prayer and normal sports" (p. 62). Students were excluded from the study if they had either a congenital defect or were taking medications that "affect planning or cognitive abilities" (p. 61).

The Tower of London test was used to assess students' cognitive outcomes in four parts: "planning time, execution time, mean total time, and the number of moves" (p. 61). Assessments were given to all students before the start and after the end of the academic year of the study.

Planning time was measured by assessing the time needed for students to plan a goal and identify intermediary steps to solve a given problem. Execution time was measured by assessing the amount of time students took to solve the given problem they had planned out, which researchers noted sometimes required students to make adjustments to their original plan. Lastly, number of moves was assessed by calculating the number of moves students took in order to solve the given problem; researchers noted that better planning ability generally reduces the number of moves needed to solve the problem.

Both control and intervention groups made statistically significant improvements from pre to post test and GES students had statistically significant improvements over controls in three out of four trials in execution ($p \leq .036$) and mean total time ($p = .04$) and one out of four trials in planning time ($p = .034$); but average differences in outcomes between groups proved non-significant (p. 63). Both groups had similar planning times, but the GES group performed each assigned task much more quickly than the MES group. The researchers highlighted this point, stating, “Yoga practice translated into increased accuracy of planning, improved speed of action, and to some extent, more precise task execution” (p. 63).

Telles, Singh, Bhardwaj, Kumar, and Balkrishna (2013) investigated the effects of a yoga intervention on the physical, cognitive, academic, and emotional outcomes of 98 randomly selected third through seventh grade students (age range = 8-13 years; 38 female) from a school in Haridwar, India over a three month period. All students had to have attended a primary school near the yoga center conducting the present research and been willing to follow the research parameters. No students had any physical or mental disabilities, including color blindness

according to research investigation. Students were divided randomly to either the yoga intervention group (n=49) or the control physical exercise group (n=49). All students practiced either a 45-minute yoga or physical exercise class five days per week for the duration of the intervention; yoga sessions were broken up into 3-5 minute increments throughout the school day and was taught by a trained yoga instructor. The yoga intervention included "pranayamas (yoga breathing techniques), sithilikarna vyayama (loosening exercises), asanas (physical postures), chanting and yoga relaxation techniques" (Interventions section, para. 1). Yoga was unique from the physical exercise program in that yoga focused on student awareness, relaxation, and breathing.

Measures included physical fitness, emotional, cognitive, and academic outcomes. Assessments of physical fitness were an anthropometry test which measures BMI, a flamingo balance test measuring the number of falls in 60 seconds standing on one leg, a plate tapping test measuring the amount of time students took to alternatively tap between two points on a plate, a standing broad jump, a handgrip test, a trunk strength test, a bent arm hang, and a 10 x 5 meter shuttle run. The Stroop color and word test was used to assess student cognitive functions. The Battle's self-esteem questionnaire (Indian adaptation) was used to assess students' self-esteem and students' academic outcomes were assessed via teacher observations. Academic measures included obedience, academic performance, attention, punctuality, and behavior with friends and teachers.

The only statistically significant finding between groups in the posttest was higher self-esteem levels in the control group (physical fitness) compared to the intervention group ($p < .05$, d - .2214). Both the yoga and physical fitness groups had within-group statistically significant

improvements in physical, cognitive, psychological, and academic outcomes, meaning both groups made similar statistically significant improvements over the course of the study. For a complete summary of within-group significant outcomes, refer to Table 2.2 in the Appendix.

Thomas, Centeio, Kulik, Somers, and McCaughtry (2016) investigated the effects of a yoga intervention on the academic achievement and cognitive outcomes of 40 third-grade students (mean age = 8 years, 22 female) from one school over a ten-week time period. Students in the experiment were divided between a yoga practicing intervention and control group; intervention students practiced 20-minute yoga sessions twice weekly and additionally learned "daily breathing exercises, relaxation techniques, and yoga poses" (p. A-68).

Six total measures were included in the study; three measured academic achievement and three measured cognitive outcomes. Each measure was assessed on a pretest/posttest basis for both groups. Academic achievement measures were the "AimsWeb Math Computation [MC], Dibels Reading Comprehension [RC], and Oral Fluency [OF]" while the cognitive measures were "Stroop [ST], Trials [TR], and Letter Comparison [LC]" (p. A-68). Elaboration or definitions of each measure were not provided in the original research article.

Results of the study did not show any statistically significant differences at post testing between groups. Researchers noted that while no statistically significant changes were found, "many of the variables showed positive gains over time and in relation to the control group" (p. A-68). Future studies over a longer period of time and with a larger sample size may affect future outcomes of yoga intervention on academic and cognitive measures.

Three MBRS studies with yoga elements were reviewed, the first being Bakosh, Mortlock, Querstret, and Morison (2018), who investigated the effects of an audio-based MBSR

program on academic performance of 337 first through fifth grade students (167 MBSR, 170 WLC) over a ten week period. Students in the study attended two separate schools (16 classrooms total); one suburban school in Illinois and one rural school in New York state. The MBSR program was created by one of the present researchers, with experience in teaching MBSR, with the help of another trained MBSR interventionist; the program was based on practices developed by the original creator of MBSR, Jon Kabat-Zinn. The study's MBSR program included 90 ten-minute audio lessons on mindfulness; each audio lesson also included a two-minute journaling element at the end of each session. Teachers in the intervention groups were instructed to play one track per day during a "normal transition time" (pp. 36-37). Classrooms participating in the study did so based on a volunteer process and individual classrooms selected for study were randomized by grade into two groups: MBSR intervention or waitlist control. Students in both groups were subjected to pre/posttesting assessments of gpa and individual subject grades; the intervention group received MBSR intervention immediately over a 10-week period, and the WLC group received intervention upon completion of the intervention study. Before beginning the intervention, all teachers were invited to attend a 60-minute training session, providing "general information related to mindfulness and the research protocol" and intervention teachers were invited to remain for the entirety of the 60 minute session, while WLC teachers attended only the first 30 minutes of the session. Upon commencement of the intervention, teachers were provided an intervention classroom kit with the mindfulness audio tapes and speaker system, an instruction guide, a classroom set of journals, and some focusing materials, such as a rain stick that the teacher and students could use throughout the day.

Measures used included overall gpa scores and individualized subject grades. The majority of subjects assessed were measured by both schools in the areas of math, science, social studies, reading, and writing. Additionally, school one included a spelling grade, while school two included a verbal communication grade. No psychological measures were assessed.

Compared to the control group, statistically significant improvements were found in three of the measures in school one and in one of the measures in school two. School one saw statistically significant improvements in math ($p = .05$, $d = 3.66$), social studies ($p = .008$, $d = 5.26$), and gpa ($p = .01$, $d = 2.72$), while school two saw statistically significant improvement in math only ($p = .001$, $d = .68$). In contrast, Bakosh, Snow, Tobias, Houlihan, and Barbosa-Leiker (2015) conducted a study of the same design and location with 93 third grade students and found out of the math, science, social studies, reading, and writing outcomes, students in the intervention group made statistically significant improvement in reading ($p = .003$) and science ($p < .0005$). Since the results of Bakosh et al. (2015) are from a smaller sample size and the study design was reimplemented in Bakosh et al. (2018), the Bakosh et al. (2015) results are included simply for comparison and are not included in the final data analysis in Chapter Three. Data from Bakosh et al. (2015) is included in the Maynard et al. (2017) meta-analysis on mindfulness.

Another MBSR study conducted by Anila and Dhanalakshmi (2016) investigated MBSR effects on the psychological and academic outcomes of 51 secondary students (age range = 15-18 years) from three schools in Kerala, India. Six schools in the same district were contacted by the researcher, with three providing permission to conduct the MBSR study; afterwhich, the researchers chose 51 students (26 MBSR, 25 C) from a pool of 300 based on individuals who had “high anxiety, low self-control, and low academic performance” (p. 391) based on anxiety

and self-control questionnaires. MBSR students attended 45-minute before school intervention sessions for eight weeks (frequency not noted by researcher). The intervention included the following practices: 1) body scan, 2) mindful yoga, and 3) sitting meditations.

A total of two psychological and one academic outcomes were included in the study. Psychological outcomes included the STAI, and Tangney's Self-Control Scale, while the academic outcome was a school report on student "continuous assessment" (p. 391). STAI measured students' anxiety levels, while Tangney's Self Control Scale assessed students' self-control, using a self-report Likert-scale.

Results showed that MBSR students had statistically significant improvement on all measures compared to control; anxiety ($p < .001$; $d = 2.12$), self-control ($p < .001$; $d = 1.72$), and academic performance ($p < .001$; $d = 2.37$). These results show that MBSR students had a large reduction in anxiety levels, greatly increased in managing emotions and behavior, and had a large improvement in overall academic performance.

Bennett and Dorjee (2015) conducted a similar MBSR study, which measured the psychological, physiological, and academic outcomes of 24 secondary students (mean age = 17.7 years; range = 16-18 years) at one secondary school in England. Eligible students were between 16-18 years of age, were enrolled in at least three General Certificate of Education (CGE) courses, and have obtained a minimum of a C-grade in at least five GCE courses. Students who were taking medication or receiving mental health counseling were excluded from the study. Students were divided into MBSR (N = 11; female = 5) and control (N = 13; female = 8) groups. Student data was collected in a pre-, post-test, and three-month follow-up format and the intervention lasted a total of eight weeks, with a single two-hour weekly MBSR session

conducted by a trained MBSR instructor at the end of the school day. Students practiced body scan, mindful movement, and mindful sitting as a part of the intervention practice.

Outcomes fell into the following three categories: 1) psychological, 2) physiological, and 3) academic. Psychological outcomes were measured by the Depression, Anxiety, Stress Scale-21 (DASS-21) and WHO-5. The DASS-21 is divided into depression, anxiety, and stress sub-outcomes for the analysis and WHO-5 is a Likert-scale well-being assessment. Physiological outcomes included the body barometer to measure stress and medical absence report to measure the percent of students who were absent in both the control and intervention groups during the intervention session times. Academic outcomes included three separate measures: 1) Fischer Family Trust (FFT), 2) Half-Term Assessments (HATs), and 3) General Certification of Education (GCE). The FFT is a standardized test used in the UK to measure and predict future academic performance in specific subjects if the student maintains a consistent academic level in the given subject. HATs is another standardized test used in the UK to assess continuous academic performance in all subject areas; during the academic year, students take HATs every six to eight weeks in the UK. The GCE assesses grade levels in specific subjects; students choose which subjects they prefer to have GCE their assessed.

Outcomes for psychological and academic outcomes did not prove significant ($p > .05$). Though p-values proved non-significant, effect sizes were moderate in the psychological subscales of depression ($d = .57$) at posttest as well as in depression ($d = .58$) and anxiety ($d = .74$) at follow-up. Effect size for GCE at follow-up was also moderate at follow-up ($d = .61$). The variance in significance between p-value and effect size warrants further investigation and may be affected by the small sample size of participants included in the study.

Mindful Movement

Shoval, Sharir, Arnon, and Tenenbaum (2018) investigated the effects of a mindful movement (MM) intervention on the cognitive outcomes of 160 kindergarten students (age range = 4-6 years, 65 female) from nine different Kindergartens within the same school district over the course of one academic year. Two Kindergarten-only schools served as the intervention MM group (n=61), two other Kindergarten-only schools served as the active control movement for its own sake (MS) group (n=54), and five other Kindergarten-only schools served as the control group (n=45). Both the MM and MS groups had 90 minutes of indoor and 90 minutes of outdoor movement activities each day, while the control group focused primarily on traditional academic study with a 45-minute outdoor recess each day. The MM group had movement activities which integrated movement into academic learning opportunities, such as numbering classroom objects and balancing on letter-shaped blocks; students had access to playground equipment both indoors and outdoors. Intervention teachers trained in MM and MS over a two year period for a total of 60 hours before beginning the intervention.

Five academic measures were assessed at pretest after the first month of the academic school year and again at posttest within the first week of the final month of the academic school year (p. 358). The researchers chose each of the measures due to the tests' abilities to assess kindergarten curricular outcomes. The academic measures were the Mathematics Achievement Test (MAT), the Comprehension Reading Test (CRT), Standard Progressive Matrix of the Raven A+B Test and C Test (SPM Matrix), and the Sequencing Test of Ordinal Numbers. The MAT assessed students' achievement in math, the CRT assessed students' ability to sort pictures related to given concepts and phonological awareness, the SPM Matrix assessed students' non-verbal

intelligence, and the Sequencing Test of Ordinal Numbers assessed students' ability to identify objects based on their ordinal position in a pictured row of objects.

Results showed the MM group improved significantly more overall than both the MS and control groups across all outcomes; the following statistical outcomes reflect the MM intervention group in comparison to both the control and MS control groups. The initial analysis showed the MM group had statistically significant greater gains on the MAT (both $p < .04$; MS $d = .48$, control $d = .37$) and sequencing scores (both $p < .016$; MS $d = .27$, control $d = .31$); one-way ANCOVA tests revealed MM students had statistically significant gains on all measures when compared to both the MS and control groups. Time by condition results showed that both MM had greater improvements on the Matrix A+B ($p < 009$), and C test ($p < .006$) than the MS ($d = .47$) and control groups ($d = .35$); but both the MM ($d = .61$) and MS groups ($d = .57$) made significantly greater improvements on the Matrix C than did the control group. Furthermore, researchers analyzed the percentage of students in each group who made improvements from pre-/posttesting versus those whom did not make improvements. The researchers found 80.3% of MM students had statistically significant improvements on MAT scores ($p < .05$): improvement for the MS was 59.3% and control was 55.6%). In the sequencing test, 62.3% of MM students made statistically significant improvement ($p < .01$) and improvement for the MS group was 38.9% and control was 22.2%. Lastly, 70.5% of MM students made statistically significant improvements on the CRT test ($p < .05$); 58.8% of MS students and 53.3% of control students made significant improvement. Overall, MM students made greater improvement in math, sequencing, and non-verbal intelligence compared to both the control and movement for its own sake (MS), but the MS group did have a greater improvement in a subtest of the non-verbal

intelligence compared to control. Additionally, it should be noted that within each of the subject groups, a greater proportion of MM students had statistically significant improvement in reading, math, and sequencing; followed by MS students having a greater proportion of improvement compared to control in the same measures.

No Intervention

Three studies assessed the relation between mindfulness and academic outcomes via student survey responses. These three studies included a total of 757 students; 219 assessed primary school students and 538 assessed university students. Two of the studies included academic-related outcomes for 514 EFL students at the primary and university level (Fallah, 2016; Lu, Huang, & Rios, 2017). Additionally, a summary of a meta-analysis conducted by the Campbell Collaboration on mindfulness in schools is included as a reference and comparison to the present literature review.

Survey

Fallah (2016) investigated the relation between mindfulness and the emotional outcomes of 295 undergraduate EFL students (age range = 18-31 years; mean age = 20.24 years; 151 female) at the University of Zabol in Zabol, Iran. All students were selected through convenience sampling in predominantly non-English study majors. All students had never travelled outside of Iran, but had studied EFL in school for six consecutive years during middle and high school. Students took three questionnaires within a two-week time frame; each questionnaire took approximately 20 minutes to complete.

Measures used in the study included the Mindfulness Attention Awareness Scale (MAAS), the Coping Self-Efficacy Scale (CSES), and the Foreign Language Classroom Anxiety

Scale (FLCAS). The MAAS measured the students' levels of mindfulness, the CSE scale measured students' levels of self-coping skills, and the FLCAS measured students levels of anxiety within the foreign language classroom setting.

All three measures revealed statistical significance. Mindfulness had a significant and positive association with CSE ($p < .01$) and a statistically significant negative association was found from mindfulness to foreign language anxiety (FLA) ($p < .01$). Similarly, CSE also had a statistically significant negative association with FLA ($p < .001$). The researchers also found that mindfulness had a statistically significant positive influence on CSE, which influenced a reduction in FLA ($p < .001$).

Hanley, Palejwala, Hanley, Canto, and Garland (2015) investigated the relationship between mindfulness levels and emotional and cognitive measures of 243 undergraduate students (mean age = 20 years, 85% female) in the College of Education program at a single university. Students volunteered for the study and received research credit, which was a requirement for their undergraduate study; students opting out of the study were given alternative assignments to fulfill the research requirement and are not included in the total number of subjects for this report. Students completed two pretests, one for dispositional mindfulness and one for positive reappraisal and thereafter completed a short general information quiz. After completing the short informational quiz, all students were informed they had scored 53%, regardless of how well they had actually performed on the quiz. As a posttest measure, students took assessments on academic self-efficacy and state affect (a subsection of the STAI) to identify how the news of their recent quiz failure affected their sense of their own academic abilities.

Four measures were used to assess both emotional and cognitive outcomes. The Positive and Negative Affect Scale (PANAS), assessed students' levels of positive and negative feelings; the Five Facet Mindfulness Questionnaire (FFMQ) assessed students' levels of mindfulness, including observing, describing, acting with awareness, and non-acting. The Cognitive Emotion Regulation Questionnaire (CERQ), assessed students' awareness of self-coping strategies after a negative experience (Garnefski & Kraaij, n.d.). The College Academic Self-Efficacy Scale (CASES) measured students' confidence in their abilities to perform various academic tasks. Lastly, the general information quiz included 15 multiple-choice questions; for example, "How many rings are on the Olympic flag? What is a rhinoceros' horn made of?" (p. 333). After taking the short quiz and receiving their failing scores, students were asked to complete a short written response about their performances. Only four students questioned the validity of their scores in the written response, while the majority of students attributed their failing score to not remembering the material or not having been warned to study particular topics on the quiz.

The researchers found mindfulness to be positively related to academic self-efficacy overall. Observing ($p < .05$, $d \geq .13$), describing ($p < .001$, $d \geq .26$), and acting with awareness ($p < .05$, $d = .15$) of the dispositional mindfulness spectrum were positively and statistically significantly associated with students' academic self-efficacy levels, though some size effects were non-significant. A direct positive and statistically significant association was found between observing ($p < .001$, $d = .2$), describing ($p < .001$, $d = .24$), and non-reacting ($p < .001$, $d = .22$) with positive reappraisal. Additionally, the researchers found a positive and statistically significant indirect effect of observing ($p < .05$, $d = .03$), describing ($p < .05$, $d = .04$), and non-reacting ($p < .05$, $d = .03$) on students' academic self-

efficacy levels. Overall, students with greater abilities in observing, describing, and acting intentionally were more likely to believe in their own academic ability. Additionally, students with higher levels of observing, describing and abilities to respond in a non-reacting manner to everyday situations were more likely to cope successfully with negative feedback.

Lu, Huang, and Rios (2017) investigated the relationship between mindfulness and the academic and cognitive measures of 219 fifth grade migrant students (93% age range = 11-12 years; 48% female) from five classes in two elementary schools in Beijing, China. The first school consisted of four classes (n = 187) and the second school consisted of one class (n = 32). All fifth grade students at the two schools were invited to participate on a volunteer basis. Students took two assessments to measure cognitive function and mindfulness levels and the researchers accessed academic performance based on the students' most recent test scores in the targeted subjects.

The researchers assessed students' academic performance, cognitive measures, and mindfulness levels. Academic performance was measured by accessing the students' most recent test scores in Chinese (L1), math, and English (L2). Academic scores were based on a 0-100 point scale (100 = best). Cognitive performance was measured by the Task Completion and Behavior Scale, which students' abilities in organization, attention control, and persistence in task completion. Lastly, the Mindful Attention Awareness Scale (MAAS) was used to measure students' mindfulness levels.

Overall, students exhibited high levels of mindfulness, academic performance, and cognitive function. On a 15-90 point scale, students self-rated on average 71.3 for mindfulness. On a 0-15 point scale, students self-rated on average 12.2 for cognitive function. As for academic

performance, on a 0-100 point scale, students averaged 82.6 in Chinese, (L1) 81.3 in math, and 76.4 in English (L2). When comparing the range of mindfulness levels, the researchers found a positive statistically significant relationship between mindfulness and academic performance ($p < .001$), as well as mindfulness and executive function ($p < .05$). The researchers found a 0.6 point increase in executive function for every 10 point level increase in mindfulness and a 1.7 point increase for Chinese, a 2.5 point increase in math, and a 2.4 point increase in English for every 10 point increase in student mindfulness levels. The researchers noted however, that when controlling for the executive function to academic performance, the mindfulness levels became negligible; meaning both executive function and mindfulness measures positively related to academic outcomes, but higher mindfulness levels did not bolster academic performance of students who also had high executive functioning.

Meta-analysis of mindfulness and metacognition intervention

Maynard, Solis, Miller, and Brendel (2017) conducted a meta-analysis of the cognitive, academic, socioemotional, and behavioral outcomes of a total of 6,207 primary and secondary students within 44 separate mindfulness intervention studies conducted from 1990-2016. All studies included in the meta-analysis followed either a randomized controlled trial or quasi-experimental design. The median age of students in the samples was 12.64 years of age and the majority of students were either primary (33%) or high school (33%); the remainder of students were either pre-school or middle school students. All interventions included some form of mindfulness component, but TM interventions were explicitly excluded from the meta-analysis, due to “concern about the religious aspect of TM” (p. 25). The length of interventions ranged from 4-28 weeks with 6-125 administered intervention sessions at a rate of once every second

week to five times weekly. The average amount of time spent practicing the mindfulness intervention was 13 hours across all studies. The most frequently used types of mindfulness interventions were breath awareness practice (86%), meditation (84%), relaxation practice (61%), body scan (45%) and at-home practice recommendation (45%). Yoga, behavior and cognitive techniques, aromatherapy, and other talk therapies were used in less than half of the studies. Ten studies included twenty measurements for cognitive outcomes across the meta-analysis ($p = .01$) and twenty-eight studies included 168 socioemotional measurements ($p < .001$) (pp. 39-41). A few of the key intervention programs used in the studies were "Mindfulness Based Stress Reduction (MBSR), Mindfulness Based Cognitive Therapy (MCBT), Learning to BREATHE, Inner Kids Program, and Acceptance and Commitment Therapy (ACT)" (p. 25).

The outcomes measured fell into five broad categories: 1) cognitive, 2) academic performance, 3) behavioral, 4) socioemotional, and 5) physiological. Cognitive outcomes included assessments on executive function, attention span, and memory. Academic performance outcomes included standardized assessments, grades in individual content areas, reading levels, and student grades. Behavioral outcomes included student aggression, disciplinary referrals, compliance to rules, attendance, and the amount of time on task. Socioemotional outcomes included anxiety and stress, engagement, social skills, self-esteem, emotion regulation, and grit. Physiological outcomes included heart rate measurements, cortisol levels, and brain activity levels. Statistically significant positive results were found in the cognitive and socioemotional outcomes across the studies.

Lan, Lo, and Hsu (2014) conducted a meta-analysis of 17 studies within 14 articles of the effects of meta-cognitive interventions on student reading comprehension. Only articles

including a computer element, reading comprehension, and a form of meta-cognitive intervention were included in the final analysis. A total of 1,210 participants were included in the studies within the meta-analysis. They ranged from primary school to undergraduate level; the majority were university students (51%), then secondary (34%), and primary (15%). The researchers also noted that while the majority of studies either listed English as the native language of participants or the L1 was unspecified, four of the studies included bilingual or second language learners. The meta-cognition intervention frequency ranged from once in ten of the studies to up to four times in the remaining studies. The intervention instruction time ranged from 30-125 minutes and ranged from one day to 9.5 weeks in duration.

The researchers divided the results of each study into four categories based on the type of meta-cognitive intervention used: 1) regulation as instruction, 2) strategy cues with think-aloud as instruction, 3) vocabulary and comprehension support as instruction, and 4) computerized environment versus hard copy. Seven studies (5 articles) used regulation as instruction and incorporated computer-based programs (CBPs) which included features such as prompting students with monitoring questions and using online tutors. Two studies (two articles) used strategy cues with think-aloud as instruction and incorporated CBPs which used text, picture, and mixed glossaries. Notably, both studies investigated the reading comprehension of second language learners of French and Spanish with English as an L1. Four studies (three articles) used vocabulary and comprehension support as instruction which included features such as picture and text glossaries of vocabulary within text. One of the vocabulary and comprehension studies investigated the reading comprehension outcomes of English-only and English language learners (ELs). Four studies (four articles) used computerized environment versus hard copy which

provided both intervention and control groups with the same type of meta-cognitive intervention. These varied in delivery; intervention groups received computerized formats and controls received manual formats (ie: digital highlighter tool vs. traditional highlighter marker on paper).

Of the 17 studies, five regulation as instruction, one strategy cues with think-aloud as instruction, two vocabulary and comprehension support as instruction, and one computerized environment versus hard copy studies revealed statistically significant improvements for intervention groups as compared to controls. The metacognitive strategy with the highest ratio of statistically significant findings in favor of the intervention group was regulation as instruction with 71%, then strategy cues and vocabulary (both 50%), and finally computer versus hard copy with 25%. Regarding second language learners (L2s), six studies investigated the reading comprehension of bilingual English language learners (ELs), French, Spanish, and English L2s, as well as English as a foreign language learners (EFLs); two of the four studies with L2s showed statistically significant results. Specifically, a study using strategy cues with think-aloud as instruction for Spanish L2s and a study investigating computer-based versus hard copy intervention for EFLs showed statistically significant outcomes for language learners.

Metacognition Intervention

Van de Kamp, Admiraal, Van Drie, and Rijlaarsdam (2015) investigated the effects of a meta-cognition intervention on the divergent thinking abilities of 104 eleventh grade students (age range = 16-17 years) from five classes at a single school in the Netherlands. All eleventh grade students were invited to participate in the study, but only students completing both pretest and posttest were included in the analysis. The researchers used a waitlist control (WLC) method, meaning WLC students received mindfulness training only after all data had been

collected for the study, so that researchers could identify any effects of the intervention against a control, while still providing a therapeutic intervention to all subjects; this method is often used in studies where it could be considered unethical to deny a potentially therapeutic intervention to all subjects in a study. Three classes received the intervention and two classes served as the control during the first half of the study, after which the two groups reversed and the original control group received the intervention during the last half of the study. The study was done as part of the school's regular arts curriculum and lasted for 19 weeks. Students attended regular art classes and received one 50-minute intervention class during the study either in the first half or second, depending on to which group they had belonged (intervention or WLC). The intervention consisted of explicit meta-cognitive instruction on divergent thinking within the scope of the regular classroom curriculum.

Measures were used in a pre/posttest manner and included a "computerized verbal instances test" and three independent measures for divergent thinking. The computerized verbal instances test required students to list as many novel ideas as they could within a five minute time frame and the divergent thinking assessments measured students' flexibility, fluency, and the originality of their responses given during the computerized verbal instances test. The researchers assessed fluency by the number of different responses, flexibility by the number of different categories of response, and originality by the statistical novelty of the response in comparison to other students within the test study. Positive statistically significant results for fluency and flexibility were found in the initial intervention group as compared to the control group. In the second round of study, in which the two groups reversed roles, the effect of the intervention became non-significant. The researchers noted the loss of statistical significance in

the second round of the intervention may have been due to the fact that all students had received the intervention by that point in the study (since the original intervention group became the control for the second half of the study).

Jaafar and Ayub (2010) investigated the relationship between meta-cognition and emotional outcomes on the academic performance of 203 undergraduate students from six groups who took the same calculus math course at a single university. The researchers used random sampling and student questionnaires to collect data; students' overall grades in math were also collected from the course professor to measure academic performance. Three measures were used to assess emotional, metacognitive, and academic outcomes of students. The Mathematics Self-Efficacy Questionnaire measured students' confidence in math studies, and the Mathematics Meta-Cognitive Questionnaire measured students' understanding of the learning strategies used in their calculus course. Both questionnaires used a four-point Likert scale. Math academic performance was measured by accessing student overall grades from the math professor. Researchers found a positive statistically significant relationship between metacognition and self-efficacy with math academic performance. The majority of students surveyed reported 3 out of 4 (moderately high) for mathematics self-efficacy and metacognition.

CHAPTER III: DISCUSSION AND CONCLUSION

This study reviewed a total of 27 mindfulness and metacognitive studies (qualitative and quantitative) with 132 total outcomes either directly or indirectly related to the academic achievement of students who ranged from Kindergarten to the University level. Overall, mindfulness interventions proved efficacious in promoting positive changes for at least one measure (academic, cognitive, or psychological) in the majority of quantitative studies (n = 21/26; 80.8%) reviewed; one qualitative study (Finnan, 2014) also found mindfulness efficacious in students' academic performance.

In studies providing individualized scores for psychological and cognitive standardized tests, the subscores were documented as outcomes, and the overall score was omitted in this review. As for gpa and composite scores on academic standards test, both composite/gpa scores and individualized grades were counted as outcomes in this review. Lastly, in the case where individualized scores were not provided for a standardized test, and the test measured more than one outcome type (academic, cognitive, psychological); the test was counted as two outcomes and one measure was given for both academic-related outcomes (ie: So and Orme-Johnson (2001) provided a composite score-only for the Group Embedded Figures Test (GEFT), which measures both cognitive and psychological outcomes; one outcome was given to psychological and one to cognitive, so the GEFT was divided into two outcomes. Refer to Table 2.1 in the Appendix for a breakdown of statistically significant outcomes by study and outcome type; specific outcomes not depicted in Table 2.1 will be cited throughout the Discussion and Conclusion.

Mindfulness' Impact on Academics

Data on academic achievement in regards to mindfulness was conducted through the lens of true academic outcomes, cognitive outcomes, and psychological outcomes. Academic outcomes assessed overall grades, individual grades, teacher academic performance reviews, and state standardized test scores, including standardized tests measuring academic standards of kindergarten and students in countries outside of the United States. Cognitive outcomes included standardized tests used to measure executive function and intelligence, and psychological outcomes included measures of anxiety (STAI), behavioral outcomes, and well-being measures.

Overall impact. The review included a total of 38 outcomes across 16 studies measuring academic outcomes in regards to mindfulness and metacognition. Statistically significant findings ($p \leq .05$) were found for 23 of the outcomes (60.5%) across ten of the studies. When analyzing for type of academic outcome, the percent of significant outcomes increases for gpa, composite standards scores, and academic performance (7/11 outcomes $p \leq .05$; 63.6%) (Anila & Dhanalakshmi, 2016; Beauchemin et al., 2008; Bennett & Dorjee, 2015; Butzer et al., 2015; Franco et al., 2010; Harpin et al., 2016; Kauts & Sharma, 2009; Nidich et al., 2011), math (6/8 outcomes $p \leq .05$; 75.0%) (Bakosh et al., 2018; Jaafar & Ayub, 2010; Lu et al., 2017; Nidich et al., 2011; Shoval et al., 2018;), second language (2/2 outcomes $p \leq .05$; 100%) (Franco et al., 2010; Lu et al., 2017), and all language and language arts (5/6 outcomes $p \leq .05$; 83.3%) (Franco et al., 2010; Lu et al., 2017; Nidich et al., 2011). The only academic measure that had a low correlation was reading (reading comprehension, oral fluency, and writing) with 1/5 outcomes having statistical significance at the $p \leq .05$ value (20.0%; Shoval et al.,

2018). Compared to Maynard et al. (2017) in the Campbell meta-analysis on mindfulness, academic results of the present analysis on appear promising for mindfulness interventions. Regarding the meta-analysis on meta-cognition and reading comprehension, the present study did not reach the same level of statistically significant improvement, though the study did not focus explicitly on computer based intervention models like Lan et al. (2014).

A total of 28 outcomes across ten studies measured cognitive outcomes. Six out of ten (60.0%) of the studies had statistically significant ($p \leq .05$) results in cognitive measures. Both Rangan et al. (2018) and Telles et al. (2013) found statistically significant outcomes for the control and intervention groups; though the intervention groups in these two studies did not outperform their control counterparts. The intervention groups in these two studies had a within-group statistically significant improvement in cognitive outcomes ($p \leq .03$). Cognitive results of the present analysis are in line with the Maynard et al. (2017) meta-analysis of mindfulness interventions.

Psychological outcomes constituted the majority of the review's studies and outcomes, with 66 total outcomes across 17 studies, including Finnan (2014), a qualitative study. The following statistics reflect the results of the quantitative studies only. Statistically significant ($p \leq .05$) findings were found in 38 (57.6%) of the outcomes across 13 (76.5%) of the studies. STAI (subsections included) was the most frequently used outcome; STAI was measured in six of the studies (Anila & Dhanalakshmi, 2016; Beauchemin et al., 2008; Elder et al., 2011; Franco et al., 2010; So & Orme-Johnson, 2001; Spillios & Janzen, 1983). Four studies which measured STAI found mindfulness significantly ($p \leq .05$) reduced student anxiety level, as measured by the STAI

assessment, in 4/5 (80%) STAI outcomes (Anila & Dhanalakshmi, 2016; Beauchemin et al., 2008; Elder et al., 2011; Franco et al., 2010; So & Orme-Johnson, 2001). Additionally, eight studies measured anxiety-related outcomes (including STAI), statistically significant ($p \leq .05$) findings in anxiety reduction was reached in 7/8 outcomes (87.5%) (Beauchemin et al., 2008; ; Elder et al., 2011; Fallah, 2017; Franco et al., 2010; So & Orme-Johnson, 2001; Tarrasch et al., 2017; Wendt et al., 2015). The Maynard et al. (2017) meta-analysis of mindfulness intervention reached similar conclusions regarding psychological outcomes.

Impact on L2 learners. The review included a total of four studies measuring academic outcomes of L2 students. Of these studies, two (50%) had statistically significant outcomes. Across the studies, ten total academic outcomes were measured, seven of which (70%) were statistically significant. Wendt et al. (2018) reported 14% and Schonert-Reichl et al. (2015) reported 34% of their subjects identified as L2s, while Fallah (2017) and Franco et al. (2010) reported 100% of participants identified as English as a foreign language (EFL) learners and foreign language (FL) learners, respectively. Seven out of seven (100%) academic outcomes reached statistical significance in L2-only participant studies.

Two studies included cognitive outcomes for L2 subjects. Three out of three (100%) cognitive measures across the two studies reached statistical significance. Of these studies, Lu et al. (2017) had L2-only subjects, and Schonert-Reichl et al. (2015) reported 34% of their subjects identified as L2.

Psychological outcomes were measured in four of the studies with L2 students. Psychological outcomes reached statistical significance in all four studies; 17/21

(81.0%) outcomes across the studies reached statistical significance. Fallah (2017) and Franco et al. (2010) included L2-only participants, while Schonert-Reichl et al. (2015) and Wendt et al. (2015) had 14-34% L2 participants. Of the two studies with L2-only participants, 8/8 outcomes (100%) reached statistical significance ($p \leq .05$).

Comparing Techniques

The techniques analyzed in the review are categorized into three main groups: meditation only, movement meditation, and meta-cognition. Within the meditation-only category, the most frequently used intervention across studies was TM (Elder et al., 2011; Nidich et al., 2011; So & Orme-Johnson, 2011; Wendt et al., 2015), followed by the MindUP program (Harpin et al., 2016; Shonert-Reichl et al., 2015). Other meditation-only practices did not have overlap across studies, but all meditation-only studies shared the quality that movement was not incorporated as an integral part of the meditation practice. Alternatively, movement meditation interventions comprised a total of 11 studies across this review, with ten teaching a form of yoga (Anila & Dhanalakshmi, 2016; Bakosh et al., 2018; Bennett & Dorjee, 2015; Butzer et al., 2015; Ehud et al., 2010; Kauts & Sharma, 2009; Rangan et al., 2008; Telles et al., 2013; Thomas et al., 2016) and Shoval et al. (2018), who implemented a program called Mindful Movement. Both types of meditation study shared the quality that movement was interconnected with meditation practice during the intervention.

Meditation only. Of the four TM studies, all three academic-related outcomes were included. For academic outcomes, two studies measured five outcomes (Nidich et al., 2011; Wendt et al., 2015); three of the outcomes (60.0%) reached statistical significance. So and Orme-Johnson (2001) measured three out of three (100%) cognitive outcomes that reached statistical

significance. Lastly, 8/12 (66.7%) psychological outcomes reached statistical significance (Elder et al., 2011; So & Orme-Johnson, 2001; Wendt et al., 2015). Wendt et al. (2015) reported 14% of the subjects identified as EL; in this study 0/2 academic outcomes and 2/5 psychological outcomes reached statistical significance.

The MindUP meditation intervention was used in Harpin et al. (2016) and Schonert-Reichl et al. (2015), and measured all three academic-related outcomes. Both MindUP studies included an academic outcome; one out of two (50.0%) reached statistical significance. Cognitive outcomes were measured in Schonert-Reichl et al. (2015) and reached statistical significance for both measured outcomes (100%). For psychological outcomes, both studies included a total of eleven outcomes across both studies; nine out of eleven (82.0%) psychological outcomes reached statistical significance. Within the MindUP studies, Schonert et al. (2015) reported outcomes for an EL population (34% of participants). For the EL study, 0/1 (0%) academic outcome, 2/2 (100%) cognitive outcomes, and 7/8 (87.5%) psychological outcomes reached statistical significance.

Overall, meditation-only interventions comprised a total of 11 studies. Eight of the 12 (66.7%) academic outcomes across seven studies, 7/14 (50%) cognitive outcomes across five studies, and 28/42 (66.7%) psychological outcomes across ten studies reached statistical significance. Of these, Franco et al. (2010), Schonert-Reichl et al. (2015, and Wendt et al. (2015) reported a minimum of 14% of participants identifying as L2s. Of the L2 studies overall, 4/7 (57.1%) academic outcomes across three studies, 2/2 (100%) cognitive outcomes in one study, and 15/19 (78.9%) psychological outcomes across the three studies reached statistical

significance. Franco et al. (2010) reported an L2-only population with statistically significant findings in 4/9 (44.4%) academic outcomes and 6/6 (100.0%) psychological outcomes.

Movement meditation. Of the ten movement meditation studies that used yoga or MBSR as an intervention, all three academic-related outcomes were measured; though Finnan (2014) conducted qualitative outcomes only, and it will not be included in the following data report. Academic outcomes reached statistical significance in 5/16 (31.3%) across seven studies (sig. Anila & Dhanalakshmi, 2016; Bakosh et al., 2018; Butzer et al., 2015; Kauts & Sharma, 2009; not sig. Bennett & Dorjee, 2015; Telles et al., 2013; Thomas et al., 2016). Cognitive outcomes were measured in Rangan et al. (2008), Telles et al. (2013), and Thomas et al. (2016), but none reached statistical significance. For psychological outcomes, 6/16 (37.5%) outcomes reached across four studies statistical significance (sig. Anila & Dhanalakshmi, 2016; Ehud et al., 2010; Telles et al., 2013; not sig. Bennett & Dorjee, 2015).

One study within the movement section of the review, Shoval et al. (2018), utilized a specially designed program called Mindful Movement. This study measured five academic outcomes; all five (100%) outcomes reached statistical significance.

Overall, the movement meditation interventions (with quantitative data) comprised ten studies. Statistical significance was reached for 10/22 (45.5%) academic outcomes across eight studies, 3/10 (30.0%) cognitive outcomes across three studies, and 6/20 (30.0%) psychological outcomes in four studies. Studies within the movement meditation category did not report having any second language learners in their subject demographics.

Metacognition. Jaafar & Ayub (2010) and Van De Kamp et al. (2015) used a meta-cognitive intervention and assessed one academic and three total cognitive outcomes for

participants. In Van De Kamp et al. (2015), 2/3 (66.7%) cognitive outcomes reached statistical significance and in Jaafar & Ayub (2010) 1/1 (100.0%) academic outcomes reached statistical significance in the remaining study. No L2 learners were reported in either metacognition study.

Professional Application

Based on the overall data, mindfulness practice can be beneficial in improving academic-related outcomes for students of all ages and may prove to be particularly beneficial to second language (L2) learners, though data specifically on L2 learners is quite limited at the current time. Within the various mindfulness techniques used across studies, TM and MindUP preliminarily appear to be more effective in improving students' academic-related outcomes than yoga across all measures. Though only Shoval et al. (2018) used the Mindful Movement program, MM is also promising in its effectiveness in improving students' academic performance. It should be noted that while the outcomes for the yoga intervention studies appear relatively ineffective, the yoga intervention was actually as effective as the regular physical exercise control groups in two out of six of the studies.

Both TM and MindUP could be easily adapted to any K12 school curriculum. Both of these programs have a well-defined curriculum and are taught by trained professionals, whether that be either by outside staff or specialized training for school staff (as is the case with MindUP).

TM. The TM program consists of a short, four-consecutive-day training by a certified TM instructor; with lessons that last approximately 1-1.5 hours depending on student age (ages 10+ have 90-minute sessions per day for four days). After the initial training, students and classroom teachers continue practicing TM on their own twice daily in the classroom or

sometimes at home, depending on the amount of time available during the school day. Based on email communication with the author from the Maharishi TM foundation, the initial four-day training costs $380 per student over the age of ten, but some scholarships and discounts may be available by contacting the local TM instructor in a given area. For students under the age of ten, the cost per student is $120 and meditation practice is five minutes, twice daily. As TM offers meditation instruction for all grade levels k12 and has a relatively low cost per student, TM could be a prudent choice for any school, especially for a school district seeking to implement a unified mindfulness program across all grade levels. One consideration for schools, however, is that the initial TM sessions may only be taught by a certified instructor, so schools incur the cost of instruction each time a new student arrives to a TM classroom.

MindUP. Alternatively, The MindUP program has a one-year initial training period and is taught school-wide by a certified MindUP instructor to the school staff. After school staff learn the MindUP program, school staff then instructs the students. MindUP consists of 15 initial lessons; thereafter, teachers are recommended to continue two to three minute “brain breaks” three times per day in their classrooms. Courses are scaffolded and broken into grade clusters of PreK-2, 3-5, and 6-8. The initial cost for a school-wide MindUP certification is $6,000-$8,000 and varies depending on the number of teachers being trained. Currently, there are no scholarships or discounts available, but there is special funding for Title 1 schools. Additionally, the MindUP organization expects to switch over to district-wide training in the United States. As MindUP offers instruction for grades PreK-8, it is ideal for primary and middle schools and may be preferred by some school districts, since school staff administers the mindfulness instruction and schools would not need to incur additional cost each year when new students enroll.

Limitations

Within each category of intervention type, aside from the TM intervention, there was a wide range in length and frequency of intervention, from a couple of weeks to a multi-year longitudinal study. Additionally, studies in the review spanned several countries and multiple continents; students were from a variety of types of community and socio-economic backgrounds. With such external variance between subject backgrounds, it can be difficult to determine the magnitude of the effect the intervention solely had on participants in comparison to other externalizing factors. This seems to be compounded by the fact that many of the studies conducted outside of the U.S. and India were the only studies conducted in those particular countries.

Additionally, aside from TM and MindUP, intervention methodologies varied greatly across studies, even within the same type of intervention category. For example, many of the yoga interventions incorporated similar elements, but each yoga intervention was unique (e.g. length, frequency, subject age). Academic-related outcomes across studies also varied greatly. Cognitive and psychological outcomes had the greatest amount of unique outcomes (specific outcomes that were not measured by more than one study). Even within the academic outcome category, which had the least variance of outcome types, there was quite a bit of variance. For instance, academic outcomes included overall gpa, individual student grades both per semester and at the end of the year, state standardized tests used by schools, teacher reports of academic achievement, and a cluster of standardized test results that were used to measure Kindergarten readiness. With such a wide range of outcomes, it may be difficult to pinpoint on what

mindfulness practice(s) have the greatest effect, especially when many of the outcome measures are unique to individual studies and not used across multiple studies.

Lastly, the number of studies measuring outcomes for L2s and meta-cognitive interventions was very low. Only five studies reported having any L2s, and two of these studies reported 14% and 34% respectively. According to the U.S. census for immigrant populations, this would be approximately the number of L2 students an average U.S. school would expect to have. As with meta-cognitive studies, only two articles consisted of empirical research, with a third article providing a meta-analysis of meta-cognitive strategies in relation to student reading comprehension. Due to the low number of studies related to these specific populations and outcomes, it is difficult to make accurate generalizations as to the effectiveness of mindfulness and meta-cognition on academic-related outcomes. Additionally, due to the limited amount of meta-cognitive studies, no data was able to be collected in order to make a connection between the influence of mindfulness on meta-cognitive teaching and student use. Though, since meta-cognition is a subcategory of mindfulness, it could be logically deduced (at least preliminarily), that students with higher levels of mindfulness would likely have or be able to develop greater meta-cognitive strategies and abilities in school.

Implications and Future Research

Since 13/22 (59.1%) of the quantitative studies in this analysis on mindfulness and metacognition (survey and meta-analyses not included) investigated the effects of intervention over a relatively short period of time, it would be interesting for future researchers to investigate more longitudinal studies on its effects. Of these 13 studies, nine studies included interventions lasting between five and ten weeks (Anila & Dhanalakshmi, 2016; Bakosh et al., 2018;

Beauchemin et al., 2008; Bennett & Dorjee, 2015; Franco et al., 2010; Harpin et al., 2016; Kauts & Sharma, 2009; Spillios & Janzen, 1983; Thomas et al., 2016), and four studies included interventions lasting 12 weeks or three months (Butzer et al., 2015; Schonert-Reichl et al., 2015; Telles et al., 2013; Vickery & Dorjee, 2016). Likewise, less than half of the studies used school-based academic outcomes (gpa, individual grades, etc.) to measure the effects of mindfulness (Anila & Dhanalakshmi, 2016; Bakosh et al., 2018; Bennett & Dorjee, 2015; Butzer et al., 2015; Franco et al., 2010; Jaafar & Ayub, 2010; Kauts & Sharma, 2009; Schonert-Reichl et al., 2015; Telles et al., 2013; Wendt et al., 2015). Since many schools would be more likely to be on board with integrating a new program into their school curriculum if research could show its effects on academic achievement, it would be beneficial for future research to do more investigation on mindfulness, using school-based measures, such as gpa and student grades. This may be in addition to other cognitive and/or psychological outcomes or as a stand-alone outcome, as some studies chose in the present study.

As for L2 populations, there are presently few studies that have investigated the effects of mindfulness on academic outcomes specifically for L2 students. Though, based on overwhelmingly positive findings from L2-only studies in Fallah (2017), Franco et al. (2010), and Lu et al. (2017), further research would be beneficial in determining whether mindfulness practice is truly more efficacious for this subpopulation. Since it may be difficult to find large groups of L2 students in the U.S., it may be useful for future researchers to simply report percent or number of L2 students within study samples and additionally provide specific data on the sub-population of their study. Schonert-Reichl et al. (2015) and Wendt et al. (2015) from the present

review provided data on the percentage of L2s in their study, but did not provide specific outcome data regarding this population in the results.

Lastly, ten of the studies in the review did not use a mindfulness vs. non-treatment control design. A waitlist control (WLC) design was used in Bakosh et al. (2018), Tarrasch et al. (2016), Van De Kamp et al. (2015), and Vickery and Dorjee (2016), while a no-control design was used in Beauchemin et al. (2008) and Ehud et al. (2010). Butzer et al. (2015) and Telles et al. (2013) used a yoga vs. physical education design, where control students participated in PE classes instead of yoga. Shoval et al. (2018) investigated a three-way design with a Mindful Movement, movement for its own sake, and true control group; similarly, So and Orme-Johnson (2001) investigated another three-way design of a Transcendental Meditation, napping, and true control groups. Since many of the yoga studies found yoga to be either more or as effective as regular physical exercise programs, it may be interesting for future researchers to conduct single studies that compare the effects of yoga and a meditation-only intervention, such as TM (which proved most prevalent and effective across meditation-only studies) in this review.

Conclusion

This review sought to identify the impact of mindfulness intervention on general and L2 students' academic performance in school, to compare the effectiveness of various mindfulness techniques, and to explore how metacognitive instruction compares to mindfulness instruction in regards to student academics. Overall, mindfulness practice appears to have a positive impact on student academic-related outcomes; providing either positive or sometimes null effects on participants. Regarding all students, mindfulness meditation practice had the greatest impact on math, language studies, and psychological outcomes. Mindfulness meditation had a significant

impact on all academic-related outcomes for studies investigating L2-only populations; though the number of studies measuring L2-only subjects is few and these results should be viewed only as very preliminary findings. Overall, mindfulness meditation without movement proved more beneficial than yoga practice, but metacognitive practice was comparatively effective to overall outcomes of mindfulness meditation; though TM and MindUP specifically warranted greater success than the metacognitive intervention on student academic-related outcomes. In all, though research on mindfulness practice in schools, (specifically L2 students) is still in its preliminary stages of empirical research, the current literature on the effects of mindfulness practice on student academic-related outcomes appears promising. With careful consideration of the student population and mindfulness program used as an intervention, future researchers may help U.S. schools make more informed decisions regarding whether mindfulness practice could benefit their students and which mindfulness program would be the best fit for their schools.

References

Ackerman, C. (2017). 23 Amazing health benefits of mindfulness for body and brain. Retrieved from https://positivepsychology.com/benefits-of-mindfulness/

Anila, M. M. & Dhanalakshmi, D. (2016). Mindfulness based stress reduction for reducing anxiety, enhancing self-control, and improving academic performance among adolescent students. *Indian Journal of Positive Psychology*, 7(4), 390-397. Retrieved from http://www.iahrw.com/index.php/home/journal_detail/19#list

Bakken, E. E. (2019). Center for Spirituality and Healing - University of Minnesota [Mindfulness-Based Stress Reduction]. Retrieved from https://www.csh.umn.edu/MBSR

Bakosh, L. S., Mortlock, J. M T., Querstret, D., & Morison, L. (2018). Audio-guided mindfulness training in schools and its effect on academic attainment: Contributing to theory and practice. *Learning and Instruction, 58*, 34-41. Doi:10.1016/j.learninstruc.2018.04.012

Bakosh, L. S., Snow, R. M., Tobias, J. M., Houlihan, J. L., & Barbosa-Leiker, C. (2015). Maximizing mindful learning: Mindful awareness intervention improves elementary school students' quarterly grades. *Mindfulness*, 7(1), 59-67. Doi: 10.1007/s12671-015-0387

Beauchemin, J., Hutchins, T. L., & Patterson, F. (2008). Mindfulness meditation may lessen anxiety, promote social skills, and improve academic performance among adolescents with learning disabilities. *Complementary Health Practice Review, 13*(1), 34-45. Doi: 10.1177/1533210107311624

Bennett, K & Dorjee, D. (2016). The impact of a mindfulness-based stress reduction course

(MBSR) on well-being and academic attainment of sixth-form students. *Mindfulness*, 7, 105-114. Doi: 10.1007/s12671-015-0430-7

Butzer, B., Van Over, M, Noggle Taylor, J. J., & Khalsa, S. B. S. (2015). Yoga may mitigate decreases in high school grades. *Evidence-Based Complementary and Alternative Medicine*. Doi: 10.1155/2015/259814

California Department of Education. (2015). *CAASPP paper based test results: Help: Term and score explanations.* Sacramento, CA: California Department of Education.

David Lynch Foundation. (2019, June). Center for Health and Wellness. Retrieved from https://www.davidlynchfoundation.org

Ehud, M., An, B., & Avshalom, S. (2010). Here and now: Yoga in Israeli schools. *International Journal of Yoga*, 3, 42-47. Doi: 10.4103/0973-6131.72629

Elder, C., Nidich, S., Colbert, R., Hagelin, J., Grayshield, L., Oviedo-Lim, D., . . . Gerace, D. (2011). Reduced psychological distress in racial and ethnic minority students practicing transcendental meditation program. *Journal of Instructional Psychology*, *38*(2), 109-116. Retrieved from https://search-proquest-com.ezproxy.bethel.edu/docview/903978554?accountid=8593

Fallah, N. (2017). Mindfulness, coping self-efficacy and foreign language anxiety: A mediation analysis. *Educational Psychology*, 37(6), 475-756. Doi: 10.1080/01443410.2016.1149549

Finnan, C. (2015). Not a waste of time: Scheduling non-academic learning activities into the school day. *Urban Review*, 47, 26-44. Doi: 10.1007/s11256-014-0286-5

Franco, C., Mañas, I., Cangas, A. J., & Gallego, J. (2010). The applications of mindfulness

with students of secondary school: Results on the academic performance, self-concept and anxiety. *Communications in Computer and Information Science, 111*, 83-97. Doi: 10.1007/978-3-642-16318-0_10

Frumos, F. (2015). Metacognitive monitoring accuracy and academic performance at university students. *Journal of Innovation in Psychology, Education, and Didactics*, 19(2), 307-314. Retrieved from https://search-proquest-com.ezproxy.bethel.edu/docview/2092793083/fulltextPDF/BD55698307C0458CPQ/1?accountid=8593

Garnefski, N. & Kraaij, V. (n.d.). Cognitive emotion regulation questionnaire (CERQ). *Universiteit Leiden*. Retrieved from https://www.universiteitleiden.nl/en/research/research-projects/social-and-behavioral-sciences/cognitive-emotion-regulation-questionnaire-cerq

Gifford-Smith, M. (2000). *Teacher social competence scale: Grade 4/Year 5 update (Fast Track Project Technical Report*. Retrieved from https://www.fasttrackproject.org

Goldie Hawn Foundation. (2018). MindUP: About Us. Retrieved from https://mindup.org/about/

Hanley, A. W., Palejwala, M. H., Hanley, R. T., Canto, A. I., & Garland, E. L. (2015). A failure in mind: Dispositional mindfulness and positive reappraisal as predictors of academic self-efficacy following failure. *Personality and Individual Differences*, 86, 332-337. Doi: 10.1016/j.paid.2015.06.033

Harlow, L. L. (2018). Significance. In B. B. Frey (Ed.), *The SAGE Encyclopedia of Educational Research, Measurement, and Evaluation* (pp. 1514-1516). Thousand Oaks: Sage Publications, Inc.

Harpin, S. B., Rossi, A., Kim, A. K., & Swanson, L. M. (2016). Behavioral impacts of a

mindfulness pilot intervention for elementary school students. *Education, 137*(2), 149-156. Retrieved from http://ezproxy.bethel.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=keh&AN=120179274&site=ehost-live&scope=site

Horwitz, E. K., Horwitz, M. B., and Cope, J. (1986). Foreign language classroom anxiety. The *Modern Language Journal*, 70(2), 125-132. Doi: 10.2307/327317

Jaafar, W. M. W. & Ayub, A. F. M. (2010). Mathematics self-efficacy and meta-cognition among university students. *Procedia Social and Behavioral Sciences*, 8, 519-524. Doi: 10.1016/j.sbspro.2010.12.071

Kabat-Zinn. (2005). *Coming to Our Senses: Healing Ourselves and the World Through Mindfulness.* New York: Hyperion.

Kauts, A. & Sharma, N. (2009). Effect of yoga on academic performance in relation to stress. *International Journal of Yoga*, 2(1). Retrieved from http://www.ijoy.org.in/

Kim, H. W. (2018). P value. In B. B. Frey (Ed.), *The SAGE Encyclopedia of Educational Research, Measurement, and Evaluation* (pp. 1195-1198). Thousand Oaks: SAGE Publications, Inc.

Kukreja, N., Saini, S., & Vig, D. (2014). Exploratory analysis of intellectual abilities, metacognitive skills, and academic performance of rural adolescents. *Journal of Health and Wellbeing*. 5(4), 527-535. Retrieved from https://www.iahrw.com/index.php/home/journal_detail/19//list

Lan, Y., Lo, Y., & Hsu, Y. (2014). The effects of meta-meta-cognitive instruction on students' reading comprehension in computerized reading contexts: A quantitative

meta-analysis. *International Forum of Educational Technology and Society*, 17(4), 186-202. Retrieved from https://www.jstor.org/stable/10.2307/jeductechsoci.17.4.186

Lu, S., Huang, C., & Rios, J. (2017). Mindfulness and academic performance: An example of migrant children in China. *Children and Youth Services Review*, 82, 53-59. Doi: 10.1016/j.childyouth.2017.09.008

Maharishi Foundation USA. (2019). *Transcendental Meditation*. Retrieved from https://www.tm.org

Maynard, B. R., Solis, M. R., Miller, V. L., & Brendel, K. E. (2017). Mindfulness-based interventions for improving cognition, academic achievement, behavior, and socioemotional functioning of primary and secondary school students. *The Campbell Collaboration*, 5-46. Doi: 10.4073/csr2017.5

Merriam-Webster Dictionary. (2019). *Metacognition*. Retrieved from https://www.merriam-webster.com/dictionary/metacogniton

Mind Life Institute. (n.d.) *Mission*. Retrieved from https://www.mindandlife.org

Mind Life Institute. (n.d.) *Programs and Events*. Retrieved from https://www.mindandlife.org

Mindfulness in Schools Project. (2019). *Bring mindfulness to your school [Step 3 - Teach Mindfulness]*. Retrieved from https://mindfulnessinschools.org

Nidich, S., Mjasiri, S., Nidich, R., Rainforth, M., Grant, J., Valosek, L., & . . . Zigler, R. (2011). Academic achievement and transcendental meditation: A study with at-risk urban middle school students. *Education, 131*(3), 556-564. Retrieved from http://link.galegroup.com.ezproxy.bethel.edu/apps/doc/A253740215/PROF?u=clic_bethel&sid=PROF&xid=73447500

Onwuegbuzie, A. J., Bailey, P., and Daley, C. E. (2000). Cognitive, affective, personality, and demographic predictors of foreign-langauge achievement. *The Journal of Educational Research*, 94(1), 3-15. Retrieved from https://www.jstor.org/stable/27542298

Rangan, R., Nagendra, H. R., & Bhat, G. R. (2008). Planning ability improves in a yogic education system compared to a modern. *International Journal of Yoga*, 1(2), 60-65. Doi: 10.410310973-6131.41033

Schonert-Reichl, K. A. & Lawlor, M. S. (2010). The effects of a mindfulness-based education program on pre- and early adolescents' well-being and social and emotional competence. *Mindfulness*, 1(3), 137-151. Doi: 10.1007/s12671-010-0011-8

Schonert-Reichl, K. A., Oberle, E., Lawlor, M. S., Abbott, D., Thomson, K., Oberlander, T. F., & Diamond, A. (2015). Enhancing cognitive and socio-emotional development through a simple-to-administer mindfulness-based school program for elementary school children: A randomized controlled trial. *Developmental Psychology, 51*(1), 52-66. Doi:10.1037/a0038454

Sharkey, J. and Layzer, C. (2000). Whose definition of success? Identifying factors that affect English language learners' access to academic success and resources. *TESOL Quarterly*, 34(2), 352-368. Retrieved from https://www.jstor.org/stable/3587961

Shoval, E., Sharir, T., Arnon, M, & Tenenbaum, G. (2018). The effects of integrating movement into the learning environment of kindergarten children in their academic achievements. *Early Childhood Education Journal*, 46, 355-364. Doi: 10.1007/s10643-017-0870-x

So, K. T. & Orme-Johnson, D. W. (2001). Three randomized experiments on the longitudinal

effects of the transcendental meditation technique on cognition. *Intelligence, 29*, 419-440. https://doi.org/10.1016/S0160-2896(01)00070-8

Spielberger, C. D., & Spielberger, C. D. (2010). State Trait anxiety inventory. In W. E. Craighead, & C. B. Nemerhoff (Eds.) The Corsini encyclopedia of psychology and behavioral science (4th ed.). Hoboken, NJ: Wiley. Retrieved from http://ezproxy.bethel.edu/login?url=https://search.credoreference.com/content/entry/wileycorsini/state_trait_anxiety_inventory/0?institutionld=712

Spillios, J. C. & Janzen, H. L. (1983). The effect of relaxation therapy on achievement for anxious learning disabled students. *School Psychology International, 4(2),* 101-107. Doi: 10.1177/0143034383042006

Tarrasch, R., Margalit-Shalom, L., & Berger, R. (2017). Enhancing visual perception and motor accuracy among school children through a mindfulness and compassion program. *Frontiers in Psychology, 8*, 281. Doi:10.3389/fpsyg.2017.00281

Telles, S., Singh, N., Bhardwaj, A. K., Kumar, A., & Balkrishna, A. (2013). Effect of yoga or physical exercise on physical, cognitive and emotional measures in children: A randomized controlled trial. *Child and Adolescent Psychiatry and Mental Health*, 7(37). Doi: 10.1186/1753-2000-7-37

Thomas, E. M., Centeio, E. E., Kulik, N, Somers, C., & McCaughtry, N. (2016). Effects of a classroom-based yoga intervention on academic achievement and cognition. *Research Quarterly for Exercise and Sport Supplement*, 87(2), A-68. Retrieved from ProQuest.

UMASS Medical School. (2017). Center for Mindfulness in Medicine, Health Care, and Society

[History of MBSR]. Retrieved from https://www.umassmed.edu/cfm/mindfulness-based-programs/mbsr-courses/about-mbsr/
history-of-mbsr/

Van de Kamp, M., Admiraal, W., Van Drie, J., & Rijlaarsdam, G. (2015). Enhancing divergent thinking in visual arts education: Effects of explicit instruction on metacognition. *British Journal of Educational Psychology*, 85, 47-58. Doi: 10.1111/bjep.12061

Vickery, C. E. & Dorjee, D. (2016). Mindfulness training in primary schools decreases negative affect and increases meta-cognition in children. *Frontiers in Psychology, 6*, 2025. Doi:10.3389/fpsyg.2015.02025

Wagener, B. (2016). Metacognitive monitoring and academic performance in college. *College Teaching*, 64(2). Retrieved from https://web-b-ebscohost-com.ezproxy.bethel.edu/ehost/detail/detail?vid=0&sid=88daa5ce-39db-40ae-be7b-be020952bbb3%40sessionmgr102&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZzY29wZT1zaXRl#AN=114245370&db=keh

Wendt, S., Hipps, J., Abrams, A., Grant, J., Valosek, L, & Nidich, S. (2015). Practicing transcendental meditation in high schools: Relationship to well-being and academic achievement among students. *Contemporary School Psychology*, *19*(4), 312-319. doi: 10.1007/s40688-015-0066-6

Appendix

Table 1
Summary of Transcendental Meditation (TM) Intervention

Step	Description	Length
1	Lecture on TM benefits	1-hour
2	Lecture on TM mechanics and background	1-hour
3	One-on-one interview with TM instructor	Brief
4	One-on-one lesson with TM instructor	2-hours
5	Group check-in with TM instructor about proper TM technique	2-hours
6	Group check-in with TM instructor about body-mind connection	2-hours
7	Group check-in with TM instructor about the importance of regular TM practice	2-hours

Note: TM initial training described in So and Orme-Johnson (2001).

Table 2.1
Summary of Outcomes Reaching Statistical Significance in Mindfulness Studies

Group	Academic		Cognitive		Psychological	
	#	%	#	%	#	%
TM						
Elder et al. (2011)					3	0.667
Wendt et al. (2015)~	2	0.000			5	0.400
So & Orme-Johnson (2001)			3	1.000	4	1.000
Nidich et al. (2011)	3	1.000				
MindUP						
Schonert-Reichl et al. (2015)~	1	0.000	2	1.000	8	0.875
Harpin et al. (2016)	1	1.000			3	0.667
Other						
Franco et al. (2010)~	4	1.000			6	1.000
Vickery & Dorjee (2016)			2	0.000	6	0.000
Tarrasch et al. (2017)			2	1.000	2	0.500
Spillios & Janzen (1983)			5	0.000	1	0.000
Beauchemin et al. (2008)	1	1.000			4	1.000
Yoga						
Butzer et al. (2015)	2	1.000				
Ehud et al. (2010)					9	0.333
Finnan (2015)					—	—
Kauts & Sharma (2009)	1	1.000				
Rangan et al. (2008)			4	0.500		
Telles et al. (2013)	1	0.000	3	0.000	5	0.200
Thomas et al. (2016)	3	0.000	3	0.000		
Bakosh et al. (2018)	6	0.167				
Anila & Dhanalakshmi (2016)	1	1.000			2	1.000
Bennett & Dorjee (2015)	3	0.000			4	0.000
Mindful Movement						
Shoval et al. (2018)	5	1.000				
Survey						
Fallah (2016)~					2	1.000
Hanley et al. (2015)					2	1.000
Lu et al. (2017)~	3	1.000	1	1.000		
Metacognition						
Van De Kamp et al. (2015)			3	0.667		
Jaafar et al. (2010)	1	1.000				

Note. # = total number of outcomes measured. % = total percent of statistically significant outcomes, shown as a decimal. ~ = L2 subjects in study. Statistical significance = $p < .05$. -- = qualitative data. No data input = n/a

Table 2.2
Statistically Significant Within Group Outcomes in Yoga and Physical Fitness Groups

Outcome	Yoga (I)		Physical Fitness (C)	
	p-value	Cohen's d	p-value	Cohen's d
Physical				
BMI	<.0001	.6936	<.0001	.4681
Sit-Ups in 30 sec.	.0003	.4468	.0001	.4638
Plate Tapping Test	.0001	.4917		
Flamingo Test			.001	.4705
Cognitive				
Word Raw Score	.0003	.2528	<0001	.3801
Color Raw Score	<.0001	.5123	<.0001	.7140
Color Test Score	.005	.3965	<.0001	.7538
Color-Word Raw Score	.001	.4561	.005	.4119
Color-Word Test Score	.001	.4775	.001	.5057
Psychological				
Self-Esteem	<.0001	.6088		
General Self-Esteem	<.0001	.7836		
Parental Self-Esteem	.01	.3662		
Improved Obedience	<.0001	.7847	<.0001	.9808
Attention	<.0001	1.0704	<.0001	1.1776
Punctuality	<.0001	.8366	<.0001	.7952
Behavior with Friends	<.0001	.7670	<.0001	.9744
Behavior with Teachers	<.0001	.8206	<.0001	1.0034
Academic				
Academic Performance	<.0001	1.0628	<.0001	.2158

Note. Empty cells denote non-significant changes. $p \leq .05$ = low significance; $p \leq .01$ = significant; $p \leq .001$ = medium significance; $p \leq .0001$ = high significance. Raw Scores-only in Cognitive outcomes are included in the statistical analysis within the Conclusion. (Telles et al., 2013).