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SCHOOL-BASED DBT SKILLS GROUPS FOR ADOLESCENT EATING DISORDERS AND BODY IMAGE CONCERNS: A PILOT STUDY

Jordan Fiorillo Scotti
The University of Montana

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JORDAN FIORILLO SCOTTI
Master of Arts, The University of Montana, Missoula, MT, 2012
Bachelor of Science, Tulane University, New Orleans, LA, 2003
Bachelor of Arts, Tulane University, New Orleans, LA 2003

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Approved by:

Sandy Ross, Associate Dean of The Graduate School
Graduate School

Margaret Beebe-Frankenberger, PhD, Chair
Department of Psychology

Anisa Goforth, PhD
Department of Psychology

Trent Atkins, PhD
Department of Curriculum and Instruction

Shan Guisinger, PhD
Affiliate to the Department of Psychology

Cheryl VanDenburg, PhD
Affiliate to the Department of Psychology

THE UNIVERSITY OF MONTANA

The Undersigned Faculty Committee Approves the
Dissertation of
Dr. Jordan Fiorillo Scotti

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Dr. Margaret Beebe-Frankenberger, Chair
Department of Psychology

Dr. Anisa Goforth
Department of Psychology

Dr. Trent Atkins
Department of Curriculum and Instruction

Dr. Shan Guisinger
Affiliate to the Department of Psychology

Dr. Cheryl VanDenburg
Affiliate to the Department of Psychology

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Approval Date

Abstract

Child and adolescent mental health concerns are increasingly being addressed in school settings. However, little research exists to evaluate how use of evidence-based interventions in an educational setting impacts treatment efficacy. Common concerns facing female adolescents in the U.S. are eating disorders (ED) and body image disturbances. To date, no studies of ED treatment in a school setting have been published, although several prevention interventions have some empirical support. Dialectical Behavior Therapy (DBT) is a comprehensive treatment approach with a growing evidence base for a variety of populations, including adolescents and patients with ED. This pilot study was designed to evaluate the efficacy and feasibility of using school-based DBT skills groups for the treatment of adolescent ED and sub-diagnostic disordered eating symptoms. The intervention included 12 weeks of DBT skills groups in a school setting without the inclusion of individual treatment or parent involvement. Additionally, participants were given the opportunity to use mobile technology software in order to track DBT skill usage and target behaviors. Data was collected to evaluate not only the impact of the intervention on ED and other mental health symptoms, but also on the acceptability and feasibility of offering this type of intervention in a school setting. Results suggest that participation was associated with improvements in behavioral facets of ED and in both externalizing and internalizing symptoms and that use of mobile technology software facilitated data collection. Additionally, measures of social validity showed a strong positive relationship between anticipated benefits of participation and acceptability ratings at post-intervention. Implications for future research are discussed.

Keywords: DBT, adolescent eating disorders, mobile technology, school-based mental health, feasibility of school-based DBT groups, social validity measurement, measures of treatment integrity

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Dedication & Acknowledgements

I dedicate this work to my family, especially my husband, whose unwavering patience and love made this possible.

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CHAPTER ONE

INTRODUCTION TO THE STUDY

Approximately 20% of children and adolescents experience symptoms of a mental disorder as defined by the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV; American Psychiatric Association, 2000), and about 5% of all children have symptoms severe enough to impair major life functioning (U.S. Department of Health and Human Services, 1999). Schools are increasingly being recognized as logical and practical settings for the provision of needed mental health services. In fact, the National Association of School Psychologists (NASP, 2008) reported that schools are the chief providers of mental health care for children in the United States. NASP advocates the provision of mental health services in schools, thereby minimizing common barriers to these services, such as transportation, accessibility, and stigma. The American Psychological Association (APA) also supports legislation to expand funding for school-based health care, including mental health, suggesting that this trend will continue. Indeed, the number of schools with mental health professionals working in school-based health clinics has doubled in the last 10 years (Chamberlain, 2009).

Mental health services in educational settings vary greatly; however, multi-tiered systems of support (MTSS) are being actively promoted by the U.S. Department of Education's Office of Special Education. As many schools shift toward an MTSS framework of academic and behavioral supports, mental health services can be offered to students both in and outside of special education. Schools have long provided limited mental health services through social skills groups, referrals for more intensive care, and some counseling services. However,

recently, schools have begun to implement programs that promote positive mental health for all children. For example, Positive Behavior Support (PBS), is a universal behavioral intervention intended to improve behavior and increase student investment in education. Other examples are the social-emotional learning programs "Strong Kids" and "Strong Teens," which are classroom instructional lessons designed promote mental health and resilience among all students. Schools around the U.S. are currently piloting new systems at the school level that include Tier 1 universal mental health programs, and more targeted (Tier 2) or intensive (Tier 3) mental health interventions. Targeted and intensive interventions can include a wide variety of health services, such as psychoeducational groups and individual therapy for identified concerns, such as social skills deficits or generalized anxiety symptoms. A gap for schools is often the targeted, Tier 2 interventions that are designed to reduce problematic behavior in specific areas. Schools have few options for teens with eating disorders or body image problems, and research into feasible and effective school-based interventions is essential for schools seeking to address these common adolescent concerns.

Even as available school-based mental health services increase, it is recognized that there are challenges to successfully implementing and maintaining mental health services in schools. For example, legislation emphasizing academic instruction and high-stakes testing, such as the No Child Left Behind Act of 2001, may have the unintentional consequence of shifting attention (and resources) away from the behavioral and emotional problems associated with academic challenges. The majority of educators recognize that academic performance is highly affected by behavioral and emotional problems. Yet, schools often operate under fiscal constraints that limit the possibility of adopting new programs, especially those that do not directly address academic

outcomes. Even schools with resources face the challenge of selecting among competing social-emotional interventions and curricula, many of which are heavily marketed, even though they may lack evidence of their effectiveness. Furthermore, while schools often purport to recognize the benefits of implementing evidence-based programs, they may still select programs without evidence or implement evidence-based programs without fidelity (Olin, Saka, Crowe, Forman, & Hoagwood, 2009). To date, little research exists regarding the way in which empirically-supported treatment approaches are necessarily (and successfully or unsuccessfully) adapted to educational settings and how these adaptations impact treatment outcomes. Accordingly, there is a great need for studies of interventions in schools and how the educational setting affects program implementation (Massey, et al., 2005).

This study seeks to evaluate the feasibility and impact of a school-based group intervention adapted from Dialectical Behavior Therapy (DBT) for the treatment of adolescent eating disorders (ED) and body image concerns. Eating disorders and sub-clinical ED syndromes are fairly common among adolescent females, with approximately 300,000-500,000 adolescents suffering with symptoms of disordered eating and body weight/shape concerns (Chamay-Weber, Narring, & Michaud, 2005). Dieting and unhealthy weight control behaviors are reported by over 50% of American teenagers, and multiple studies suggest that these behaviors frequently continue into adulthood and, for many females, evolve into full-blown ED (e.g., Kotler, Cohen, Davies, Pine, & Walsh, 2001). Dialectical Behavior Therapy was selected as the primary treatment modality in this study because DBT has been shown to successfully teach skills that enable adolescents to manage symptoms associated with a variety of mental health concerns, including self-injurious behavior, borderline personality disorder, and bipolar

disorder. Furthermore, several researchers have adapted DBT for the treatment of ED in adolescents (Safer, Lock, & Courturier, 2007; Salbach-Andrae, Bohnekamp, Pfeiffer, & Lehmkuhl, 2008), with results suggesting that DBT may be a promising therapeutic approach for the treatment of ED. However, none of these studies has evaluated the efficacy of using DBT treatment in a school setting, and none has relied exclusively on a group therapy format without individual treatment. Therefore, this research seeks to evaluate if a school-based DBT group intervention is an appropriate and useful group treatment format for addressing symptoms of ED and sub-diagnostic body image concerns and disordered eating behaviors.

While the recognition of adolescence as a distinct stage of life is not universal, research supports the conclusion that pubertal change is associated with physical, emotional, and cognitive developments unique to this period in the lifespan (Bronk, 2011). As hormonal and neurological changes occur, adolescents show greater emotionality and risk-taking behaviors, giving rise to some of the behavioral and psychological concerns commonly associated with adolescence. However, these changes also coincide with an increasing capacity for self-reflection and higher-level thinking, thanks in part to prefrontal synaptic pruning that takes place during adolescence (Steinberg, 2008). These developmental features make adolescence an ideal time to intervene, particularly using a treatment approach that emphasizes self-awareness. DBT teaches mindfulness skills as the foundation for developing more advanced behavioral strategies and offers the opportunity to learn and practice skills, including interpersonal effectiveness, emotion regulation, and distress tolerance skills. These skills necessitate the self-awareness and self-regulation skills that adolescents are newly enjoying. Furthermore, because their brains are still developing, adolescents may be uniquely poised to experience positive, long-term neural

changes associated with participation in a skill-building mental health intervention (Steinberg et al., 2004).

This study also included novel use of mobile technology for the purpose of tracking target behaviors, including ED-related behaviors and DBT skill usage. First, daily text message reminders were used to encourage regular self-monitoring by participants. All study participants received such reminders at their preferred times. Additionally, a mobile application was developed and installed onto the mobile phones and laptops of study participants who chose to use such technology. Participants tracked their daily behavior data using either the application or paper and pencil forms provided. Student feedback on use of these technologies was collected following completion of this study.

In summary, this study is the first if its kind to make use of school-based DBT groups as an intervention for adolescents identified as having ED, disordered eating, and/or body image concerns. The intervention was also unique in that it included 12 weeks of DBT skills groups without the inclusion of individual treatment or parent involvement. Additionally, participants were given the opportunity to make use of technology designed specifically for this study in order to track DBT skill usage and target behaviors. Data was collected to evaluate not only the impact of the intervention on ED and other mental health symptoms, but also on the acceptability and feasibility of offering this type of intervention in a school setting.

CHAPTER 2

LITERATURE REVIEW

Adolescent Mental Health

Adolescence has long been characterized as a tumultuous transitional stage rife with emotional lability, sexual promiscuity, and rebellion against authority. Even Aristotle characterized youth as prone to sexuality, lack of self-restraint, and insolence (Cole & Packer, 2011). American adolescents, in particular, seem to be defined by the problems thought to be inherent to their developmental stage: drug abuse, sexually transmitted diseases, eating disorders, and violence. In fact, some have charged that adolescence in the United States is pathologized to such a great extent that it meets criteria for a culture-bound syndrome (Hill & Fortenberry, 1992). A growing body of research has been dedicated to understanding the concerns and strengths unique to adolescents; however, the very notion of adolescence as a universal developmental stage continues to be debated.

Adolescence As We Know It: A Cultural Invention

While puberty is agreed to be a universal phase of development, recognition of its correlated psychosocial features are not. Indeed, the term *adolescence* came into circulation following sweeping societal changes in the United States and Europe during the mid-nineteenth century – namely, increasing urbanization and industrialization – that resulted in mandatory education for children up to age 14, creating a prolonged period of school-based socialization following puberty. In Western cultures, advancing technology supported the need for prolonged periods of education for youth, establishing the "cultural invention" of adolescence as we know it (Esman, 1990).

There is growing agreement among social scientists that the phenomenology of adolescence, including its duration, behavioral characteristics, and role in social and family organization, is largely culturally determined. Indeed, increasing industrialization around the world has led to an expansion in length of adolescence for certain cultural-demographic populations; and yet, there remains enormous variability in the degree to which the developmental shift to adulthood qualifies as a distinctive stage for individuals around the world (Arnett, 2011).

Historical Theories of Adolescence

Popular and scientific notions of adolescence can be traced back to psychological theories developed in Western Europe and the United States during the late 19th century. In particular, the work of psychologist G. Stanley Hall greatly influenced the field, as he was the first psychologist to advance a "psychology of adolescence" and use scientific methods to study adolescents. Hall's 1904 volumes about adolescence, *Psychology and Its Relations to Physiology, Anthropology, Sociology, Sex, Crime, Religion, and Education*, offered a depiction of adolescence as a transition stage of the soul that lasted from age 12 or 13 to between 22 and 25 years of age. Hall famously described this stage of life as a period of *Sturm und Drang*, or "storm and stress," a term borrowed from an 18th century German literary movement characterized by idealism, commitment to a goal, revolution against the old, expression of feeling, passion, and suffering.

Freud's psychoanalytic theory posited adolescence as a stage of psychosexual development that occurs relatively independently from the environment. His theory emphasized the central role of biological factors in the adolescent process, framing this developmental period

as a stage of adaptation to puberty. Freud believed it was biological changes – most notably, maturation of the sexual organs and the increased salience of their accompanying sexual impulses – that were critical to changing patterns of object relations and behavior (Freud, 1905). Fitting with the "storm and stress" described by Hall, Freud stated that adolescence ushers in a period of increased negative emotions, such as moodiness, anxiety, and loathing.

Social science has emphasized the influence of changing social roles and societal expectations during the transition from childhood to adulthood (Esman, 1990). Developmental psychologist Erik Erikson (1950) sought to incorporate sociological and Freudian psychological perspectives within a psychosocial model of development. Erikson's model proposed the need to consolidate a sense of identity as the pivotal developmental task for adolescents. Like Freud and Hall, Erikson viewed adolescence as a time of "storm and stress," and attributed this distress to the adolescent's lack of identity.

Anthropologist Margaret Mead famously challenged Hall's characterization of adolescence as a time of "storm and stress." Mead's book, *Coming of Age in Samoa* (Mead, 1928), argued that Samoan culture influenced development in such a way that the transition from childhood to adulthood was not characterized by turbulence. She attributed this to the Samoan culture's lack of judgment and pressure placed on adolescents about sexuality, which she characterized as pervasive in American culture. Mead went on to hypothesize that Westernized, co-figurative societies are more likely to experience intergenerational strife due to greater mobility and the impact of technological advances that make life for young people vastly different from that of older generations. Mead's work was later criticized on a variety of

methodological bases, but a growing body of subsequent research has sought to clarify the truth of Mead's cultural supremacy argument (Freeman, 1983).

Universal Adolescent Changes

Evidence for adolescence as a universal stage of development comes from fossil records of hominids and to similarities in the development of non-human primates. For example, on the basis of fossil records, Bogin (2009) has asserted that adolescence emerged as a distinctive stage of life with the transition of *Homo sapiens* from *Homo erectus*. He proposed that the emergence of this stage offered an evolutionary advantage by allowing time for the adolescent to learn adult behavior (economic, social, and sexual) that would make reproduction more successful. Evolutionary psychologists tend to agree that the biological, neurological, and psychological changes that occur in adolescence are essential for learning the myriad complex tasks necessary for ensuring so-called "cultural reproduction", which enhances the likelihood of biological reproduction resulting in perpetuation of a species (Cole & Packer, 2011).

Many of the biological changes that occur in adolescence appear to be mediated by the endocrine system and include a period of marked height and weight gain, the development of secondary sex characteristics, changes in the distribution of fat and muscle, and changes to the circulatory and respiratory systems. The exact time of onset of puberty is influenced both by genetic and environmental factors. For example, in the United States, the average age of puberty for females is between 7 and 13, but African American and Mexican American girls tend to mature earlier than their European-American counterparts. In the United States, the average age of puberty onset for males is between 9.5 and 13.5 years of age. Physical changes associated

with puberty, including increased testosterone levels, play a role in the initiation of sexual desire and activity, which in turn appear to influence social behavior.

During adolescent development, new cognitive abilities emerge. For example, deductive and inductive reasoning capacities increase, allowing for more efficient and effective decision-making. For many adolescents, this period is marked by heightened self-consciousness and an increased ability and tendency to look inward in self-examination. The prefrontal cortex is responsible for complicated cognitive activities, such as planning, decision making, weighing risks and rewards, and controlling impulses. Pruning – the process by which unnecessary connections between neurons are eliminated – occurs throughout the lifespan, but prefrontal pruning appears to occur during adolescence, with most complete by mid-adolescence (Steinberg, 2008). The elimination of unused neuronal connections coincides with evidence of major improvements in basic information processing and logical reasoning (Keating, 2004). The expansion of such cognitive capacities appears to continue until approximately age 20; however, changes after mid-adolescence are modest in magnitude (Steinberg, 2008).

Common characterizations of adolescents as moody and irresponsible can be at least partially explained by changes in the brain's socio-emotional system during this time of life. For example, it's believed that restructuring of the dopaminergic system leads to an increased sensitivity to rewards. As these changes outpace prefrontal neuronal development, adolescents are more prone to engage in risky behavior, especially when with friends (Blakemore, 2012). Later, when adolescents go on to develop complementary systems – such as the brain's cognitive control system, which facilitates behavioral and emotional regulation – risk-taking behavior typically decreases (Bronk, 2011). Furthermore, changes in the workings of several

neurotransmitters in the limbic system – most notably dopamine and serotonin - may contribute to heightened emotionality among adolescents. Changes in the limbic system are also associated with increased vulnerability to depression and other mental health problems.

The last decade has ushered in a huge quantity of new information about adolescent brain development, aided by increasingly available technologies, such as magnetic resonance imaging equipment. Researchers are now easily able to map changes in gray matter and observe brain activity in adolescents. Taken together, these studies suggest that much of what is distinctive about adolescence can be accounted for by neuronal restructuring that occurs following puberty. Furthermore, although these biological changes seem to be universal, the nature of such neuronal restructuring is shaped by adolescent experience. Specifically, synaptic pruning renders unused neuronal connections eliminated and well-used neuronal pathways strengthened. Therefore, adolescence offers an incredible window of opportunity to learn and practice adaptive coping strategies that are useful throughout the lifespan.

Erikson's psychosocial model posited that establishment of a coherent sense of self is the major task of adolescence. He suggested that this process is universal and challenging for all youth, as it requires piecing together disparate facets of one's values and self-image. Indeed, a host of empirical evidence suggests that self-understanding becomes more nuanced and complex during adolescence (Bronk, 2011). One important aspect of identity development involves learning what it means to be male or female in one's society. Sex-typing refers to the process of acquiring values and behaviors considered appropriate for one's sex. This process occurs throughout childhood; however, it's thought that pressure to behave in sex-appropriate ways may intensify during adolescence. Moreover, studies consistently demonstrate that gender

stereotypes offer powerful standards against which most adolescents judge themselves and others (Bronk, 2011).

In summary, adolescence is a developmental stage marked by a series of biochemical events associated with a growth spurt and the development of potential for biological reproduction. Furthermore, brain maturation and changes in sociocultural circumstances coincide with new cognitive capacities that are thought to promote a period of re-examination and re-orientation to the world and one's role in it (Cole & Packer, 2011). However, while the biological changes associated with the ability to reproduce appear universal, the societal recognition and experience of adolescence is not.

Cross-Cultural Experiences in Adolescence

Research has shown that the Hmong people recognize no transition stage between childhood and adulthood; instead, adulthood begins as childhood ends, around age 10 or 11 (Choudhury, 2010). Similarly, adolescence as a distinctive stage is not considered the same for male and female Inuit of the Canadian Arctic. Studies of these societies indicate that females are considered to be adults at menarche, while males are considered to be adults when they demonstrate the ability to build a snow house and hunt large game unassisted, following a period of learning and physical development after puberty (Cole & Packer, 2011). Among those Inuit studied in the Canadian arctic, only the males can be considered to go through a stage of adolescent transition; females, in contrast, move directly from childhood to adulthood.

Accounts as ancient as those of Aristotle have characterized youth as struggling toward adulthood; yet, a growing body of cross-cultural research suggests that many of the popularly touted features of adolescence are not evident across cultures. For example, accounts of

adolescent impetuosity, aggression, and insolence were reported more frequently for males than females in literature about primates as well as in descriptions offered from ancient societies (Cole & Packer, 2011). Notably, most historical accounts of this developmental period were based upon observations of ancient urban males of higher status that attended training or schooling of some kind, who were poised in the midst of a natural transition period between puberty and adulthood. Females, who were less often characterized in these terms, were typically not schooled and were often married and sent to live with their new families before they had gone through puberty. This historical distinction is telling – and is analogous to the continued presence of disproportionate opportunities for youth from countries and families with more wealth to have access to a prolonged developmental transition period designed to ready them for adulthood.

In many societies today, adolescence appears to be a privilege reserved for those who can afford to delay the economic burdens of adulthood. For example, research of adolescence in Bangladesh found that childhood can extend to allow for a transition period for children who attend school or who otherwise do not have financial responsibilities; in contrast, children who enter employment are no longer considered children as soon as they begin to work, even if this occurs at age six (Blanchett, 1996, as cited by Choudhury, 2010). Recent research into the development of youth among wealthier nations has uncovered yet another stage of development – a stage following adolescence - known as "emerging adulthood," that lasts into the third decade of life (Arnett, 2011). This stage follows adolescence and encompasses roughly the ages 18 through 25. During this time, "emerging adults" in developed nations are typically concluding their educations and exploring career and partner options while completing the process of

identity development begun in adolescence (Arnett, 2011). The experience of emerging adulthood worldwide tends to be limited to those in middle and higher social classes; however, participation in this developmental phase is expanding, largely driven by the same forces that helped establish adolescence as a distinct stage of transition for industrialized youth.

Schlegal & Barry (1991) completed a cross-cultural study of adolescents in over 175 societies around the world (including tribal and traditional) and concluded that adolescence is a universally marked social stage driven by the development of reproductive capacities. However, they did not observe the features of "storm and stress" asserted by Hall as ubiquitous features of this developmental stage. Furthermore, the notion of adolescence as ushering in antisocial behavior, violence, and aggression were not born out across cultures. Additional research bolsters this finding and suggests that U.S. and Western European adolescents suffer inordinately from much-touted adolescent "problems" such as premarital pregnancy, illicit drug use, violence, low school achievement, and sexually transmitted disease (Weisfield & Coleman, 2005). Therefore, it seems that the "luxury" of adolescence – reserved only for those who can afford it – is likely to be accompanied by the challenges for which this developmental era is notorious.

Additional research supports the conclusion that adolescent emotional understanding (Liem, Lim, & Liem, 2000), moral reasoning (Skoe et al., 1999), behavioral inhibition (Rubin, 1998), and self-concept (Offer, Ostrov, Howard, & Atkinson, 1988) vary across cultures. The notion of developing one's identity, as emphasized by Erikson, is likely to vary in accordance with an environment's emphasis placed on individuality, social, environmental, and spiritual connectedness. Furthermore, child-rearing practices have been shown to hold a strong influence in shaping the "cultural self" (Quinn, 2003). Culturally-shaped ideas of the person are likely to

influence the development of cognitive and neural processing during adolescence, as supported by neural differences shown in adult and children of individualist and collectivist cultures when reflecting on self-other paradigms (Choudhury, 2010).

Adolescent Storm and Stress: A Fallacy?

Studies do suggest that conflict between adolescents and parents increases during early adolescence (Collins & Steinberg, 2006). Researchers have hypothesized that this developmental phenomenon is likely due to expanded cognitive abilities that allow adolescents to challenge their parents' views. For example, adolescents' hypothetical and idealistic thinking may lead them to compare their parents against ideals, creating a discrepancy. Stereotyped images of near-constant conflict are not supported by research, however; parents and adolescents tend to share values and beliefs about the need to work hard, academic and career aspirations, and religious and political beliefs (Bronk, 2011). Arguments that occur tend to focus on everyday events, such as chores and curfews, and only about 20% of families engage in intense, ongoing conflict (Montemayor, 1982).

Adolescents are also experiencing biological and cognitive transitions that are likely to be associated with an increased tendency to look inward in self-reflection. These expanded cognitive capacities can make adolescents newly aware of discrepancies between their "real" and "ideal" selves. Some have posited that this may be the cause of certain disorders more prevalent among Western adolescents, such as eating disorders (Hopton, 2011). Others have suggested that feelings of uniqueness that accompany adolescent self-exploration are associated with increased risk-taking, as adolescents believe that they alone can avoid the negative consequences of risk behavior (Bronk, 2011). Hormonal changes that accompany puberty are also linked with

rapid mood shifts that, when combined with new abilities for interpreting these feelings, may result in increased rates of depression and even suicide (Arnett, 1999). These features of this developmental stage pose challenges to adolescents, but there is little support for the "storm and stress" paradigm so pervasive in Western media. Indeed, "research finds that most adolescents…have a positive self-image, are self-confident and optimistic about their future, are happy most of the time, enjoy life, value work and school, have positive feelings toward their families, and demonstrate the capacity to cope with life's stresses" (Bronk, 2011).

The Globalization of Adolescent Culture

In many parts of the world, adolescents can be identified by a common set of beliefs and practices. Schlegal & Barry (1991) found that 80% of societies they sampled offered evidence of adolescence being marked by distinctive beliefs, clothing, hair styles or body decoration. While these practices can be contrasted cross-culturally to reflect differences in cultural customs and expression, commonalities have purportedly been increasing, driven by a globalization of adolescent culture.

In the last decade, the importation of highly commercialized and sexualized cultural products from the United States and Europe has proliferated. This contemporary adolescent culture has varied features, but tends to place importance on technology, the centrality of peers, and the struggle of individuation (Nelson & Nelson, 2010). Imported cultural products can evoke concern from adults who do not approve of the cultural values being explored or adopted by their youth, and who may construe their importation as cultural imperialism (Cole, 2005). This can be linked to intergenerational conflict, even in societies that have traditionally had little conflict of

the sort, suggesting that it's not only the content – but also the woes – of industrialized adolescent life that are being imported!

Eating Disorders Among Adolescents

Adolescents, who are increasingly invested in developing identities apart from those of their parents, tend to look to peers, media, and pop culture for clues as to valued attributes in their societies. Across the Western world, there is no mistaking the messages contained in widespread media images idealizing wealth, youth, and beauty. These images promote a narrow definition of "beauty," and emphasize the importance of appearance, especially thinness. Consumption of these images is associated with body dissatisfaction and body preoccupation, referred to by some researchers as "normative discontent" to describe the "normal" female experience of being dissatisfied with one's weight in North America (Oliver-Pyatt, 2003). As critical stages of brain development are underway during this developmental stage, adolescents are especially likely to have their identity development, values, and beliefs influenced by media messages (Thomsen, McCoy, & Williams, 2001). Furthermore, with prefrontal brain development incomplete and limbic systems hyper-sensitive to the influence of the dopaminergic reward system (Blakemore, 2012), adolescents may be more likely to engage in risky weight-control behaviors, such as extreme dieting and exercise, in order to meet the unrealistic standards set by their culture (Neumark-Sztainer et al., 2011). As discussed below, these factors combine to make adolescents especially vulnerable to the development of eating disorders.

Eating Disorders (ED) are mental disorders marked by disturbances in eating behavior and are considered to be the third most common chronic illness among adolescents, after obesity and asthma (Chamay-Weber, Narring, & Michaud, 2005). The 4th text revision of the *Diagnostic*

and statistical manual of mental disorders (DSM-IV; American Psychiatric Association, 2000), which was the most updated version of this text available during the intervention period, recognized three eating disorders: Anorexia Nervosa (AN), Bulimia Nervosa (BN), and Eating Disorder Not Otherwise Specified (EDNOS). The 5th edition of the DSM (DSM-V; American Psychiatric Association, 2013), published following completion of the intervention, added Binge Eating Disorder (BED) as its own category of ED.

Anorexia Nervosa was defined by the DSM-IV as a disorder with the following criteria:

a) Refusal to maintain body weight at or above a minimally normal weight for age and height (generally set at 85% of the weight expected); or failure to make expected weight gain during a period of growth;
b) Intense fear of gaining weight or becoming fat, despite being underweight;
c) Disturbance in the way in which one experiences his or her body weight or shape; undue influence of body weight and shape on self-evaluation; or denial of the seriousness of current low body weight;
d) Amenorrhea in post-menarcheal females.

Changes to the criteria for AN in the DSM-V include removal of the word "refusal" from Criterion A, in recognition of the fact that intention on the part of the patient may be difficult to assess. Criterion B was expanded to include not only an expressed fear of weight gain, but also persistent behavior that interferes with weight gain. Furthermore, the DSM-IV-TR Criterion D was removed entirely, as it did not apply to males, pre or post-menarchial females, or individuals using certain forms of contraception.

Anorexia Nervosa (AN) is categorized into two types: Restricting and Binge-Eating/Purging. Individuals meeting criteria for the Restricting Type do not regularly engage in binge-eating or compensatory/purging behaviors (i.e., self-induced vomiting, misuse of laxatives, etc.) Individuals are categorized as the Binge-Eating/Purging Type if they regularly engage periods of overeating followed by compensatory behavior.

Bulimia Nervosa was defined by the DSM-IV by the following criteria:

a) Recurrent episodes of binge eating, which is characterized by both of the following:
    a. Eating, during a discrete period of time, an amount of food larger than most people would eat during a similar period of time and circumstances;
    b. A sense of lack of control over eating during the episode
b) Recurrent inappropriate compensatory behavior utilized to prevent weight gain;
c) The binge eating and inappropriate compensatory behavior occur an average of at least twice per week for three months;
d) Self-evaluation by the individual is unduly influenced by body weight and shape;
e) The disturbance does not occur exclusively during episodes of AN.

Bulimia Nervosa (BN) was broken down by the DSM-IV-TR into two types: Purging and Non-purging; however, this distinction scheme was abandoned in the DSM-V. The DSM-V also

reduced the required frequency of binge eating episodes to once per week, rather than twice per week.

Disordered eating patterns, including sub-threshold AN and/or BN, are typically diagnosed as Eating Disorder Not Otherwise Specified (EDNOS). EDNOS remains the most frequently diagnosed eating disorder based on DSM-IV-TR criteria (APA, 2000). Eating Disorder Not Otherwise Specified (EDNOS) is used to classify individuals with symptoms of AN and/or BN that do not meet the criteria for duration, compensatory behavior, or restrictive behaviors as listed in the DSM-IV-TR. Within the category of EDNOS, the DSM-IV-TR recognized Binge Eating Disorder (BED), now its own category of ED in the DSM-V. The DSM-IV-TR and DSM-V criteria for BED are as follows:

a) Recurrent episodes of binge eating, which is characterized as above with BN;
b) The binge-eating episodes are associated with three or more of the following:
    a. Eating much more rapidly than normal;
    b. Eating until feeling uncomfortably full;
    c. Eating large amounts of food when not physically hungry;
    d. Eating alone because of embarrassment due to the amount one is eating;
    e. Feeling disgusted with oneself, depressed, or very guilty after overeating;
c) Marked distress regarding binge-eating;
d) The binge-eating occurs, on average, at least two days per week for six months;

e) The binge eating is not associated with the regular use of inappropriate compensatory behaviors (as described above) and does not occur exclusively during the course of AN or BN.

The growing prevalence of eating disorders among adolescents in industrialized countries presents a major challenge for health professionals: An estimated 6.65 million females between the ages of 15 and 25 suffer from an ED (SCDMH, 2013). Approximately 50,000 adolescent girls (aged 15-19) in the United States have Anorexia Nervosa (AN), and between 100,000 and 2000,000 meet diagnostic criteria for Binge-Eating Disorder (BED) and Bulimia Nervosa (BN), with many more showing sub-diagnostic levels of disordered eating symptoms and body image concerns.

The medical and psychological consequences of ED are numerous, with risk of mortality increasing with the duration of the illness. Unfortunately, ED tends to persist or recur throughout the lifetime of the patient (Steinhausen, 2002). Serious medical complications result from these disorders with cardiac complications and death being the ultimate danger. AN has the highest mortality rate, with death most commonly due to medical complications and suicide (Berkman, Lohr, & Bulik, 2007). Studies of BN and BED-related mortality are scant, but the imperative for evidence-based treatment approaches for ED is indisputable.

More commonly found among adolescents than ED are sub-clinical ED or "partial" ED syndromes: approximately 300,000 – 500,000 adolescents suffer from sub-diagnostic levels of disordered eating and weight/body shape concerns (Chamay-Weber, Narring, & Michaud, 2005). Existing diagnostic criteria for ED require substantial intensity and/or duration, which is often difficult to demonstrate with younger patients. Furthermore, diagnosing clinicians must use

caution not to make a diagnosis on the basis of normal developmental shifts in abilities and problems, such as the increased attention to pubertal body changes that is likely to emerge in adolescence. Indeed, developmental changes in adolescence are often accompanied by body image concerns and weight control behaviors: epidemiological studies reveal that in the United States, 46-80% of adolescent females report weight dissatisfaction and 26-77% report having dieted (Chamay-Weber, Narring, & Michaud, 2005). Other studies suggest that over one half of American teenage girls use unhealthy weight control behaviors, such as skipping meals, fasting, smoking cigarettes, or purging with laxatives or vomiting (Neumark-Sztainer, 2005). Furthermore, a recent longitudinal study revealed that American females reported increased usage of extreme weight control behaviors (use of laxatives, self-induced vomiting, or diet pills) between the time of adolescence and early adulthood (8.4% to 20.4%; Neumark-Sztainer et al., 2011).

Debate continues within the psychological community as to whether ED are rightly conceptualized as a discrete entities differing qualitatively from normality or whether eating attitudes and behaviors exist along a continuum that includes normality. Much evidence exists for the continuum hypothesis of ED, suggesting that dieting and milder disordered eating behaviors are potentially early forms of ED that, with the presence of enough risk factors, evolve into full-blown ED. According to this theory, an adolescent with sub-clinical ED should be treated as "at risk" for the development of ED. Longitudinal research offers some support for this contention; among 16-year old females who reported partial ED symptoms, 38% still met criteria for partial ED 12 months later, 7% had developed full BN, and 52% showed a remission in symptoms (Santonastaso, Friederici, & Favaro, 1999). A more recent longitudinal study

showed that girls who dieted in adolescence were significantly more likely to diet in young adulthood, and that those who used unhealthy weight control behaviors in adolescence were at significantly greater risk for use of those behaviors in young and middle adulthood (Neumark-Sztainer et al., 2011). Other studies have supported this finding (e.g., Kotler, Cohen, Davies, Pine, & Walsh, 2001; Patton, Selzer, Coffey, Carlin, & Wolfe, 1999), suggesting that the presence of ED symptoms in adolescent increases the risk of having full ED in early adulthood. Notably, however, most adolescents with ED symptoms do not go on to develop full ED. That is, most adolescents showing symptoms of ED experience spontaneous remission, most likely associated with the development of more diverse and improved means for handling distress and body dissatisfaction (Chamay-Weber, Narring, & Michaud, 2005). Certain adolescents may also be less vulnerable to diet-induced hormonal changes that have been shown precipitate the development of ED symptoms, especially among those who develop AN (Guisinger, 2003). If true, these statistics offer hope that early interventions that discourage dieting and/or facilitate the development of adaptive coping skills may help to prevent the development of ED.

Etiology of Eating Disorders: Current Theories

Women and girls are ten times more likely to develop ED than boys or men (Fairburn & Beglin, 1990). Anorexia nervosa (AN) and BN are almost exclusively disorders found in females, while men comprise about one-third of the population suffering from BED (Spitzer, Devlin, Walsh, Hasin, Wing, & Marcus, 1992, as cited by Wilson, Becker, & Heffernan, 2003). Numerous studies have suggested the increased risk of developing an ED for females is partly due to the emphasis placed on "beauty" as a fundamental component of femininity in most industrialized societies (Mussell, Binford, & Fulkerson, 2000). A high drive for thinness, weight

concerns, and dieting are common risk factors for the development of ED. Not surprisingly, both dieting and weight concerns have high base rates among young women in the United States and Europe (Mussell, Binford, & Fulkerson, 2000).

Mass media imagery depicting a thin ideal body type for women is common to most industrialized nations. These images have been blamed for the proliferation of body image concerns among young women and adolescents. For example, several studies have suggested that the introduction of television to more rural areas across the globe is associated with a reported increase in disturbed eating behavior (Becker, Burwell, Herzog, Hamburg, & Gulman, 2002; Markey, 2004). A 2008 meta-analysis sought to clarify inconsistent research findings addressing this contention, and concluded that exposure to media images depicting the thin-ideal body is related to body image concerns for women (Grabe, Hyde, & Ward, 2008). They reported small to moderate mean effect sizes for a sample of 77 experimental and correlational studies. Given these findings, it is clear that some aspect of disordered eating is culturally-driven and that children learn what is considered to be attractive within a larger sociocultural context (Markey, 2004). In the United States, children as young as five years consistently indicate a preference for thinness and recognize social pressures to be thin: one study found that 42% of 1st - 3rd grade girls want to be thinner (Collins, 1991), and another found that 81% of 10 year olds report being afraid of being fat (Mellin et al., 1991).

While messages from one's culture influence and reinforce certain choices about food intake, disordered eating behavior is becomes increasingly involuntary as ED develop. In fact, a growing body of evidence suggests that biological mechanisms may underlie the phenomenology of ED. Studies of patients with AN suggest that the cognitive and behavioral symptoms of AN

may in fact be *caused by*, and not the cause of, weight loss among individuals with a genetic vulnerability to AN (Guisinger, 2003). Studies have pointed toward heritable leptin-mediated neuroendocrine anomalies that impact the appetite regulation system of anorexics (Müller, Föcker, Holtkamp, Herpertz-Dahlmann, & Hebebrand, 2009). These genetic polymorphisms are most commonly triggered in adolescence when growth spurts of height and body weight may misalign, but can be triggered at any age if a person has the genetic vulnerability and loses sufficient weight. When an individual has reached a certain threshold of low body weight, food "refusal" is no longer a matter of non-compliance; AN patients may want to eat, but cannot do so thanks to body signals that make them feel sated and full of energy (Guisinger, 2003). This theory is bolstered by evidence that AN has existed across cultures and historical eras that do not share the thin-ideal celebrated in Western societies today. Today, however, biologically vulnerable females most often trigger the onset of AN through dieting in an effort to meet culturally-imposed standards of "beauty." Other biological vulnerabilities, such as abnormalities in serotonergic pathways, have been implicated in the development of ED; however, more research is needed to understand the extent to which biological-genetic factors influence the development of ED.

Despite emerging evidence of the biological underpinnings of ED, these disorders continue to be commonly conceptualized as stemming from difficulty adapting to normative developmental changes (American Psychiatric Association, 2000). For example, significant transitions in life circumstances or relationships have been shown to coincide with the onset of eating disorders (Lacey, Coker, Birthnell, 1986). Experiences of strong affect have also been shown to precede binge eating episodes, leading researchers to suggest that some disordered

eating behavior may be an attempt to regulate strong or painful emotions (Chen & Safer, 2010). Adolescence is a time of significant physical, social, and developmental transition, and adolescents that have not yet mastered adaptive techniques for managing the strong emotions may be particularly vulnerable to developing disordered eating patterns.

Other known risk factors for ED include participation in athletics, familial characteristics, and biological factors. A history of trauma, particularly sexual abuse or neglect, is an important risk factor for many psychological disorders, including ED (Mussell, Binford, & Fulkerson, 2000). Even without overt trauma, childhood events and certain familial dynamics and environments have been identified as risk factors for the development of ED. For example, numerous studies have demonstrated that maternal over-protectiveness and enmeshed relationships are associated with AN (Mussell, Binford, & Fulkerson, 2000). A study by Davis & Katzman (1999) linked a familial emphasis on competitiveness to disordered eating. Furthermore, a collection of studies on maternal weight concerns, parental modeling of the importance of thinness, and fathers' preference for particular body types collectively suggested that children of parents who are overly concerned with weight and body shape are at an increased risk of developing ED (Mussell, Binford, & Fulkerson, 2000).

Research has also suggested that personality traits, such as perfectionism, negative self-evaluation, low self-esteem, and perceived ineffectiveness have been associated with the development of ED (Fairburn, Cooper, Doll, Norman, & O'Conner, 2000). Adult females with ED often have concurrent diagnoses of personality pathology, suggesting that an examination of personality features may enhance our understanding of ED etiology. These theories are not

inherently incompatible with biological-genetic theories of ED development; however, most treatment approaches tend to focus on psychosocial variables correlated with ED.

Treatments for Adolescent Eating Disorders

Due to difficulties in studying adolescent ED, there is a dearth of literature on appropriate treatment approaches. Studies on the efficacy of treatments are inconclusive at best, with the assessment of treatment efficacy is further complicated by the lack of one agreed-upon definition of symptom remission. To date, fewer than ten randomized clinical trials for the treatment of adolescent AN have been published. Nearly all of these are small in scale and focus on some form of family therapy. There are less than five published randomized clinical trials for adolescent BN, all with limitations similar to those for studies of AN. Far less work has examined BED in adolescents despite an increasing awareness that this disorder exists in both children and adolescents.

The current evidence base for ED treatment in children and adolescents is synthesized in the "Blue Menu" (Hawaii State Department of Health, 2009). The "Blue Menu" is a tool that ranks psychosocial interventions for children and adolescents based on the amount and quality of evidence supporting the treatments. At this time, no treatment for eating disorders qualifies for Level 1 ("Best") support; although, CBT and Family therapy (FT/FST/FBT) are given Level 2 ("Good") support. Studies suggest that cognitive behavioral therapy (CBT) models are most effective for adolescent BN, and that family-based treatment (FBT) is effective for adolescent AN and BN (Fairburn, 2005; LeGrange, Crosby, Rathouz, & Levanthal, 2007). Anti-depressants may also be a promising treatment for adolescent BN (Berkman, Lohr, & Bulik, 2007). BED appears to be the most receptive ED to treatment: successful outcomes were demonstrated with a

variety of psychological interventions and with traditional behavioral weight loss treatment (Wilson, Becker, & Heffernan, 2003). A study by Wilson and Fairburn (2002) revealed that anti-depressant medications also appeared to generate short-term improvements in children and adults with BED (as cited by Wilson, Becker, & Heffernan, 2003). Although the evidence base supports the aforementioned treatment approaches, outcomes vary widely, and many adolescents move into adulthood continuing to suffer from intermittent periods of disordered eating and remission (Wilson, Becker, & Heffernan, 2003).

Dialectical Behavior Therapy

Dialectical behavior therapy (DBT) is a treatment approach originally developed for female outpatients diagnosed with borderline personality disorder (BPD; Linehan, Armstong, Suarez, Allmon, & Heard, 1991). Miller, Rathus, Linehan, Wetzler, and Leigh (1997) and Miller, Rathus, DuBose, Dexter-Mazza, and Goldklang (2007a) adapted DBT to treat suicidal adolescents (DBT-A). DBT-A has a growing evidence base that suggests it may be a powerful treatment modality for a variety of adolescent problem behaviors, especially those related to emotion regulation, including self-injurious behavior, borderline personality disorder, bipolar disorder, eating disorders, and oppositional defiant disorder. Several researchers have adapted DBT for the treatment of ED in adults (i.e., Kroger, Schweiger, Sipos, Kliem, Arnold, Schunert, & Reinecker, 2010; Safer, Robinson, & Jo, 2010) and adolescents (Safer, Lock, & Courturier, 2007; Salbach-Andrae, Bohnekamp, Pfeiffer, & Lehmkuhl, 2008), with results suggesting that DBT may be a promising therapeutic approach for the treatment of ED in both adults and adolescents.

Structure of Dialectical Behavior Therapy

Muehlenkamp (2006) stated that the major principle behind DBT is to achieve equilibrium of behavior change and self-acceptance. DBT embraces elements of Western behavior, cognitive, and client-centered therapeutic approaches, as well as principles from Zen Buddhism. DBT group training, as originally designed by Linehan (1993a), entails sessions of learning and practicing the skills of Mindfulness, Distress Tolerance, Emotion Regulation, and Interpersonal Effectiveness. Mindfulness teaches clients to turn attention inward and observe themselves non-judgmentally; Distress Tolerance focuses on teaching the client how to better handle distress; Emotional Regulation increases the client's control over his or her emotions; and Interpersonal Effectiveness builds skills in dealing with conflict, expressing wants and needs, and increasing self-respect (Linehan, 1993b). DBT-A was designed to target the affective instability and difficulty in regulating emotions that are characteristic of suicidal and para-suicidal adolescents, and to address issues that can affect suicidal adolescents, such as depression, relationship issues, and school problems (Miller, Rathus, & Linehan, 2007b).

Dialectical Behavior Therapy (DBT) for the treatment of eating disorders is based on the affect-regulation model, which conceptualizes disordered eating as a behavioral attempt to influence or control painful emotional states. Evidence of emotional dysregulation in patients with ED is supported by research showing that patients with BN and BED commonly experience emotional intensity and dyscontrol (Telch & Agras, 1996), and that patients with AN commonly tend to avoid emotions and have difficulties with the identification and awareness of emotions (Casper, Hedecker, & McClough, 1992). DBT for ED aims to minimize maladaptive coping

mechanisms (e.g. disordered eating patterns) by helping patients more effectively regulate their emotions through replacing self-injurious behaviors with constructive ones.

Traditional DBT contains three components: DBT skills groups in which members are taught practical techniques in the areas of mindfulness, emotion regulation, distress tolerance, and interpersonal effectiveness; weekly individual therapy with a clinician trained in DBT; and between-session support as needed to help implement, maintain, and generalize safety skills. The dialectic at the core of this treatment is the coexistence of acceptance (of one's emotional responsiveness) and change (of self-destructive behavior). The focus is on decreasing high-risk behaviors while also enhancing respect for self.

DBT offers a treatment hierarchy, which helps identify the therapy goals, including which target behaviors to manage or eliminate before shifting the focus to developing more advanced skills. The typical treatment hierarchy (which has been modified across studies to adapt to the problem areas being addressed) includes the following (Linehan, 1993a):

1. Suicidal or self-injurious behaviors
2. Treatment-interfering behaviors
3. Building a positive sense of self and a life worth living

DBT and Adolescent ED: The Existing Evidence Base

The use of DBT for adolescents with ED is being increasingly investigated. The first pilot study on the effectiveness of DBT for adolescent patients suffering from ED was published by Salbach, Klinknowski, Pfeiffer, Lehmkuhl, and Korte in 2007. The study, conducted in Germany, examined DBT for treatment of 31 female, inpatient adolescents suffering from AN and BN and found preliminary evidence supporting the use of DBT with that population. That

same year, a case report examined DBT for use with one 16-year old female outpatient adolescent with BED. Authors detailed their modifications of DBT-A for use with BED, and found that objective binge episodes decreased from 20 binges over 28 days pre-treatment to only 1 binge in the 3 months post-treatment. Weight, shape, and eating concerns also decreased significantly from pre to post-treatment, suggesting that DBT may be a useful treatment for adolescent BED (Safer, Lock, & Couturier, 2007).

Salbach-Andrae, Bohnekamp, Pfeiffer, and Lehmkuhl (2008) completed a study with 12 outpatient female adolescents (6 with AN and 6 with BN) between the ages of 12 and 18 years old (M = 16.5, SD = 1.0). DBT treatment lasted 25 weeks and researchers added a supplemental unit to the core skills training that addressed body image and eating concerns. Treatment included weekly 100 minute group skills training, weekly 50 minute individual therapy, and inter-session phone coaching, as needed. Parents were included in 8 of the 25 skills groups. Researchers found that, of the 4 adolescents meeting criteria for AN, Restricting Type (ANR) at the start of treatment, none met criteria for ED at posttreatment. Two participants met criteria for AN, Binge/Purge Type (ANBP) at the start of treatment; following treatment, 1 met criteria for ANBP and 1 did not meet criteria for ED. All participants with AN saw a significant increase in BMI over the course of treatment, with mean BMI increased from 15.6 (SD = 1.0) to 18.1 (SD = 1.0).

Of the 6 participants who began the study with diagnoses of BN, Purging Type (BNP), 3 continued to have diagnoses of BNP at the end of treatment, 2 had diagnoses of EDNOS, and 1 dropped out prematurely. Results indicated a significant reduction of bingeing and vomiting frequency in all patients who endorsed these behaviors at the start of the study. Notably, 2

individuals with BN would have met diagnostic criteria for personality disorders had they been 18 years or older, and 3 others had Axis I DSM-IV-TR diagnoses. Only one patient with BNP did not have a comorbid Axis I diagnosis, while half of patients with ANR had no diagnoses apart from ED (the other half had Dysthymia). Patients with ANBP had diagnoses of Dysthymia and Major Depression. Therefore, individuals diagnosed with BN showed greater psychopathology at the start of treatment and outcomes, when contrasted upon diagnostic categories (AN vs. BN), may not be appropriate in establishing for whom DBT may work best. Accordingly, all participants endorsed food restriction at the start of the study; at the end of treatment, a reduction in food restriction was reported for 9 of 11 patients. In addition to reductions in disturbed eating patterns, researchers found a significant reduction in general psychopathology following treatment.

Only one controlled study of DBT with adolescent ED has been published (Salbach-Andrae, Bohnekamp, Bierbaum, Schneider, Thurn, Stiglmayr, Lenz, Pfeiffer, & Lehmkuhl, 2009). The 2009 study randomly assigned 50 outpatient adolescents (aged 12.4-21.0 years) with AN and BN to two therapeutic conditions (CBT and DBT) and one waitlisted (control) condition. At the end of the treatment, 42% of the CBT group, 38% of the DBT group, and all control-condition patients still fulfilled DSM-IV-TR criteria for ED. Compared to the waitlisted patients, DBT (and CBT) patients demonstrated a reduction in calorie avoidance, enhanced meal frequency, and improved psychological distress and increased mean BMI. Small positive effects were also seen regarding body image distortion, autonomy development, emotion regulation, and perfectionism.

Modified Adolescent DBT: Skills Groups Only

Only one study has examined the use of DBT skills groups for adolescents without individual therapy or caretaker participation. Nelson-Gray and colleagues (2006) examined use of a DBT skills group for outpatient adolescents with diagnoses of oppositional defiant disorder (ODD). Fifty-four adolescents who met criteria for ODD were recruited and assigned to groups with 5 to 9 members for 16 weekly, 2 hour group skills sessions at either a clinic or a public high school. All core skills modules except Mindfulness were taught, and no individual treatment was offered. Sixty-nine percent of participants completed the full course of treatment, and 5 individuals opted to do a second round of DBT.

Researchers attempted to increase generalization of DBT skills through homework assignments and booster sessions, and provided participants with pizza dinner and monetary rewards for homework completion. Transportation was provided to groups, and telephone calls and home visits were used to collect data from caregivers. Notably, this sample of 32 participants was more diverse than previous studies in age (M = 12.6, range = 10-15), racial characteristics (43% African American, 40% Caucasian, and 3% Latino), and gender composition (27 males, 5 females). All participants had diagnoses of ODD, based on parent report.

For those who completed treatment, t-tests revealed a significant increase in interpersonal strength and reductions in ODD symptoms and externalizing behaviors from pre- to post-treatment. Furthermore, participant reports showed significant reductions in depressive symptoms and internalizing behaviors, and reductions in externalizing behaviors approached significance. The reliable change index (RCI; Jacobson & Truax, 1991) was used to measure the

clinical significance of change for all pre- and post-treatment measures. The RCI seeks to determine if change is clinically significant by taking into account the reliability of the measure, variability of scores in the group, and the individual's score change from pre- to post-treatment. Of participants who were in the clinical range on at least one caregiver-completed measure at pre-treatment, 77% changed to the non-clinical range by the end of treatment. In addition, 71% showed clinically significant improvement, while 13% of participants showed clinically significant deterioration from pre- to post-treatment on at least one caregiver-completed measure. For measures completed by participants, 91% of those who were in the clinical range at pre-test improved to the non-clinical range at post-test.

A study reported at a paper presentation at the National Association of School Psychologists Annual Convention (Hanson, 2012), offered initially promising results using ongoing school-based DBT skills groups at Lincoln High School in Portland, OR. The school developed a DBT program for course credit that included weekly group skills classes and individual sessions, as well as parent training and telephone consultation for the adolescents. The treatment included the four core modules of DBT and was offered in semester-long or year-long options. The treatment team consisted of the school psychologist, counselor, social worker, nurse, practicum students, and interns. Students in the five groups that have been completed were assessed pre- and post-intervention with the Behavior Assessment System for Children, Second Edition (BASC-2); results suggested that students experienced decreased anxiety, depression, social stress, and anger control, and demonstrated increased school attendance and GPA.

DBT and other mindfulness-based treatment approaches are increasingly being used to treat a wide array of symptoms in school settings. For example, one recent study demonstrated that 97 students from high stress communities benefitted from 12 weeks of school-wide mindfulness training. Students who received the treatment reported reductions in worrying and stress, and improved peer relationships (Mendelson, et al., 2010).

Mobile Technology and Behavior Change

Mobile phone usage worldwide exceeded 4 billion subscribers by the end of 2008, with over 95% of countries offering mobile phone networks (Cole-Lewis & Kershaw, 2010). The proliferation of mobile technology has created ample opportunity for school psychologists, clinicians, and researchers to make use of new technology platforms to modify or enhance existing clinical practices and interventions. Common mobile technology advances in mental and behavioral health include the usage of mobile phone-based applications ("apps") to track behavioral data and the use of phone calls and text messages (SMS) for motivation and/or to cue the practice of certain behaviors; however, the potential uses of mobile technology are boundless.

Empirical support for the ability of mobile technology to facilitate behavior change is increasingly available, with mobile technology being embraced in many behavioral health domains (Dimeff, Paves, Skutch, & Woodstock, 2010). For example, health fields are coming to investigate the utility of using text message reminders to aid in treatment adherence. A recent meta-analysis sought to evaluate findings from randomized controlled trials of disease prevention and management utilizing text messaging as a key component of intervention (Cole-Lewis & Kershaw, 2010). Authors evaluated nine studies and concluded that eight showed text

messaging to be a useful tool for behavior change interventions. The studies reviewed included measured behavior changes, such as smoking cessation, diabetes management, and weight loss, and looked at both adult and adolescent populations. Notably, 8 of the 9 studies were completed in developing countries. More research is needed to evaluate the utility of text messages and other mobile technology to facilitate treatment adherence in a broader array of settings (e.g., in a school setting, where phone use may be limited or prohibited), populations, and clinical concerns.

DBT Skills Mastery: Technological Assistance

Therapeutic success in DBT rests upon the ability of individuals to generalize skills learned in DBT therapy to their everyday environment. Research supports the contention that skills acquisition and practice is an important mechanism of change for DBT participants (Neacsiu, Rizvi, & Linehan, 2010). One way this goal is achieved in comprehensive DBT is through phone coaching; however, phone coaching can be time-consuming and taxing for the therapist offering the phone coaching service.

A recent study explored the feasibility of a mobile phone application, called the "DBT Coach," designed to encourage and facilitate the practice of DBT skills among individuals with BPD and substance use disorders (SUD; Rizvi, Dimeff, Skutch, Carroll, & Linehan, 2011). Twenty-two (22) individuals with BPD and SUD completed a DBT treatment program and were given smartphones with the DBT Coach application for 10-14 days. Researchers reported that participants indicated significant decreases in emotional intensity and urges to use substances during the study; they also reported high ratings of usability and helpfulness for the mobile application. Participants showed decreases in depression and level of distress, suggesting that

the DBT Coach, and potentially similar technologies, may be useful tools for supporting the mastery of DBT skills, especially when experiencing urges to use maladaptive coping mechanisms.

CHAPTER 3

RESEARCH METHODOLOGY

Single Case Analysis

Single case studies are single subject research designs considered to be one of the best for evaluating intervention effectiveness (Brown-Chidsey, Steege, & Mace, 2008). Single case designs are perfectly suited to a response-to-intervention (RTI) framework as they enable school psychologists to carefully evaluate a student's response to instruction or to a specific intervention. Utilization of single case studies has been recognized as being particularly effective at Tiers 2 and 3 of RTI (Brown-Chidsey & Steege, 2005), as they allow a student support team to evaluate if adequate progress has been made following introduction of an intervention. In the absence of sufficient progress, an intervention can be modified or intensified based on existing data. Using a problem-solving approach, evidence of failure to exhibit adequate change following intervention can also inform decisions regarding eligibility for special education services. Use of single case designs also meets the ethical and legal guidelines set forth for school psychologists by the National Association of School Psychologists (NASP), as they are obligated to utilize evidence-based interventions and to use data to drive the problem-solving process.

While the use of case studies dates back to Freud, the practice of evaluating intervention effects using in depth studies of individuals is a mainstay of contemporary psychological practice. Notwithstanding their common usage, single case designs suffer from significant threats to internal validity. Although the subject's baseline behavior serves as the "control" in single case design, , it can be difficult to establish that the intervention – and not any number of

confounding variables – is responsible for the observed outcomes. Further, determining if "adequate" progress has been made following intervention can be challenging. Drawing valid inferences from single case studies is maximized when researchers undertake certain design considerations. Kazdin (1981) offered five design considerations most critical to single case designs: type of data, frequency of assessment, projection of outcomes before and after intervention, observed effects, and replications.

Types of Data

According to Kazdin (1981), the types of data best suited to single case analysis are observable, operationally-defined behaviors. For a behavior to be operationally-defined, it must include a definition of what the behavior looks like, the dimensions upon which the behavior is measured, and the measurement method (Lane & Beebe-Frankenberger, 2004). Once these criteria have been defined, behaviors are readily quantified, thereby reducing bias in data collection.

Lane and Beebe-Frankenberger (2004) offer additional recommendations for considering the types of data appropriate for progress monitoring and evaluating outcomes in single case designs: measures of progress and outcomes must be considered according to the reliability, sensitivity, and feasibility of the data collection methods or instruments. It is critical that measures are sufficiently reliable so that changes over time can be attributed to clinical improvement, rather than to measurement error. Measures must also have demonstrated sensitivity to detect incrementally small changes in the variable of interest in the allotted period of time. Finally, measures should be selected with consideration of available resources, including time for assessment, expense, and complexity of administration.

Assessment Frequency

With regard to assessment frequency, multiple assessments prior to intervention initiation and during implementation offer the greatest opportunity to detect a functional relationships between the independent and dependent variables. Data should be collected at predetermined intervals during the intervention and then graphed to evaluate outcomes (Lane & Beebe-Frankenberger, 2004). A researcher can more readily dismiss the possibility that random or uncontrolled events influenced outcomes if the target behaviors show stability prior to beginning the intervention and the replacement behaviors show stability following clinical improvement.

Size of Effects & Replication

The presence of large and immediate effects also strengthens the attribution of outcomes to intervention, as does the presence of similar outcomes across multiple participants, particularly those participants with significant heterogeneity in age or diagnosis. Replication also strengthens this inference, and can be achieved in multiple ways, such as staggering the introduction of an intervention across time or across settings. Staggered onset can help establish that behavioral improvements occur following introduction of the intervention, thereby providing some control for common threats to internal validity, such as history and maturation (Brown-Chidsey, Steege, & Mace, 2008).

Social Validity: Social Significance, Acceptability, Importance

The probability of drawing valid inferences from single case designs can also be increased by measuring the social validity of a treatment. This includes measurement of social significance (*Are the goals meaningful and functional?*), treatment acceptability (*Is the*

intervention acceptable for all parties and for the setting?), and social importance (*Will the benefits outweigh the costs?*) An intervention that is not meaningful or acceptable to a student, parent, or teacher is unlikely to generate desired outcomes or to be implemented as designed, even if the treatment has a strong evidence base (Lane & Beebe-Frankenberger, 2004).

Treatment Integrity

Data offering evidence of adherence to intervention protocol strengthens the inference that outcomes are the result of the intervention. This is an important – and often overlooked – facet of data-based decision making: one cannot draw inferences about an intervention's effectiveness if the intervention is not implemented with fidelity. When treatment integrity is not measured, one cannot be assured that outcomes are the result of the independent variable and the study suffers from a lack of internal validity. Without evidence of treatment integrity, one can never be sure if it was the intervention (and not some modification to it) that created the observed outcomes. Treatment integrity is therefore fundamental to internal validity. Moreover, if a study suffers from lack of internal validity, researchers cannot draw inferences about the likelihood of success using the intervention with other students or in other settings, thereby diminishing external validity. When modifications to an intervention must be made, these should be carefully documented. Doing so enables researchers to evaluate the necessity of each component of an intervention and to replicate the intervention with fidelity the next time (Lane & Beebe-Frankenberger, 2004).

Tracking Replacement Behaviors

When an intervention seeks to replace undesirable behaviors (e.g., self-harm when distressed) with replacement behaviors (e.g., using a DBT coping skill, such as calling a friend,

when distressed), the target behavior and the replacement behavior should both be monitored. The replacement behavior should provide at least equal, if not greater, reinforcement value in order to render target behaviors irrelevant. Increases in the frequency of replacement behaviors that co-occur with decreases in the target behavior suggest that the replacement behavior is offering a functionally equivalent option that the student is adopting. As this inference cannot be made without data to support it, data collection should include both the target behavior and replacement behavior or skills being taught (Lane & Beebe-Frankenberger, 2004).

Student Self-Monitoring

When monitoring student progress, it is important to select in advance who (among parents, students, teachers, therapist, etc.) will collect the data. This study relied primarily on student self-monitoring data to evaluate progress before, during, and following the intervention. Research has shown that student self-monitoring is effective for students with academic, emotional, and behavior difficulties and can be especially useful when tracking internalizing symptoms, such as depression and anxiety (Lane & Beebe-Frankenberger, 2004).

Self-monitoring is an essential component to DBT, and participants use a weekly diary card to track daily emotions, problem behaviors, and skills usage. Data from these diary cards drives in-group discussions of barriers to skill usage and enables therapists working individually with clients to complete behavior chain analyses. The act of self-monitoring is thought to facilitate practice of DBT skills and, as described above, researchers are increasingly investigating methods of using mobile technology to facilitate self-monitoring in DBT clients (Rizvi, Dimeff, Skutch, Carroll, & Linehan, 2011).

Generalization & Maintenance

When an intervention is undertaken, it is done so with the hope that participants will leave the experience having gained skills that will continue to benefit them outside of the intervention or training context. *Generalization* is said to have been established when learned behaviors occur under a variety of circumstances, such as settings, without the need for training conditions (such as reinforcement); *maintenance* refers to the continued performance of learned behaviors after an intervention has concluded (Lane & Beebe-Frankenberger, 2004). Assessment of generalization and maintenance is an important component of evidence-based decision making for a number of reasons. For one, evidence of generalization and maintenance strengthens the inference that outcomes are linked to the treatment. Furthermore, lack of generalization and maintenance suggests that an intervention may need adjustment. Assessment of student improvement should therefore continue beyond the end of an intervention in order to evaluate outcomes across settings, time, and environmental and social conditions.

DBT Skills Groups and Adolescent ED: This Pilot Study

This research endeavor is a pilot study designed to evaluate the efficacy and feasibility of using school-based DBT skills groups for the treatment and adolescent ED and sub-diagnostic disordered eating symptoms. This pilot study sought to answer three primary research questions, detailed below.

Research Question One

Will participation in a school-based DBT skills group be associated with reductions in ED symptoms and improved general functioning?

Hypothesis One. Participation in school-based DBT skills groups will be associated with reductions in ED symptoms and improved general functioning, as measured by changes in ED behaviors and scores changes on measures of ED symptoms and general functioning. Additionally, DBT skill usage is predicted to offer adaptive methods for managing emotional difficulties that are associated with disordered eating patterns; therefore, participants will concurrently increase DBT skill usage as disordered eating behaviors decrease during and following completion of this intervention.

Research Question Two

Will use of mobile technology application for tracking behavioral and cognitive symptoms associated with ED and DBT skill practice be acceptable and rated as helpful by participants?

Hypothesis Two. Mobile technology will be readily mastered and used by study participants and use of such technology will be rated as helpful and acceptable by participants.

Research Question Three

Will implementation of a 12-week DBT skills group in a school setting be rated as helpful and feasible by study participants, parents, and school staff?

Hypothesis Three. School-based DBT will be rated as helpful by participants, parents, and school staff. Furthermore, these reporters will rate the experience of this intervention as feasible for replication in a school setting.

Significance of this Study

Several facets of this study make it stand apart from previous studies of DBT for adolescent ED. First, the study was conducted in a school setting. Only one unpublished study

of adolescent DBT (Hanson, 2012) has made use of a school setting and, to date, no study of treatment for adolescent ED has been implemented in a school. The Substance Abuse and Mental Health Services Administration (SAMHSA, 2012) found that youth aged 12 to 17 are most likely to receive mental health care in an educational setting, with 2.9 million children receiving treatment in schools in 2010. Therefore, this study sought to offer treatment in the setting where children are already most likely to receive mental health services and to establish if an educational setting is appropriate and effective for this type of intervention.

Second, this modified DBT intervention used a group-only treatment modality and did not include individual therapy sessions or caretaker participation. Treatment in a group format is cost-effective, and school-based DBT groups can target a larger number of students in the setting in which they are already most likely to receive counseling. Furthermore, because individual therapy is often not widely available in school settings, individual DBT treatment was not included in this design. Caretaker participation is also often unavailable for students with the greatest needs; therefore, this intervention did not include parent participation in skills groups.

Finally, this study made use of mobile technology to remind participants to track their behavior change data and their DBT skill practices. The group facilitators developed an online data tracking sheet that could be used on a computer or mobile device application for smartphones to track such information for those students who expressed a desire to use such technology in lieu of using paper-and-pencil methods. Based on available literature, this is the first study to evaluate the use of mobile technology in the acquisition of DBT skills among students participating in a school-based DBT skills group intervention.

Data from this study were assessed using a variety of methods, including single case research methodology. As discussed previously, single case designs suffer from multiple threats to internal and external validity. This study sought to meet the recommendations for optimal single case design whenever possible, and employed the following design controls:

a) Behavioral data was operationally defined and tracked daily using a mobile technology application or paper-and-pencil spreadsheet; daily text message reminders were used to help study participants record behavior frequency at regular intervals. Each week, participants and facilitators discussed any barriers to data collection that had arisen and adjusted the timing of text message reminders or adjusted tracking methods on order to maximize the reliability of data collection (e.g., switching from mobile technology to paper-and-pencil methods when computer access was limited).

b) Behavioral data was collected for three weeks prior to implementing the intervention in order to establish a stable baseline of functioning.

c) Multiple participants across two groups received the intervention in order to evaluate treatment outcomes across settings and participants.

d) Data on social validity was collected from participants, parents, and teachers.

e) Treatment fidelity was ensured using lesson plan forms developed by Lane & Beebe-Frankenberger (2004) and through reliance on a manualized DBT approach, including use of materials provided in the Linehan's text on cognitive behavioral treatment for borderline personality disorder (Linehan, 1993a) and the accompanying workbook (Linehan, 1993b). The sequence of skill development was modeled after the DBT adaptation for treating adolescent BED by Safer, Lock, & Couturier, (2007).

Treatment adherence was evaluated through participant data collection, which was reviewed weekly in session.

f) Generalization and maintenance was evaluated using data collected at one and three months following completion of the intervention.

Methods

Participants

Six female participants were recruited from a high school and three from a middle school in Western Montana. Two of the high school students that signed up to be in the study were later unable to participate due to relocating; they were included in pre and post-intervention assessments as controls in the group analysis design. Participants were between the ages of 14 and 18 and were referred by their parent(s), principal, school counselor and/or school psychologist. Table 1 below provides demographic summary information for the study participants.

Table 1

Participant Sociodemographic Information

Age		*n*	*M (Range)*
	High School Experimental	4	*16.75 (15-18)*
	Middle School Experimental	3	*13.67 (13-14)*
	Control Group	2	*16.5 (16-17)*
Race		*n*	
	White, non-Hispanic	6	

Table 1, cont'd.			
Race	American Indian/Alaska Native	2	
	Hispanic/Latino	1	

Participants with ED symptoms or body image concerns (as reported by referral source) were included, even if they did not meet DSM-IV-TR criteria for ED (the DSM-V had not yet been published at that time). Researchers secured parental consent and student assent for participation prior to beginning the study. High school participants were given permission to leave one class on one day each week in order to attend group and were offered credit toward their academic requirements and entered in a drawing to win $50 iPod gift cards as incentives for participation. Middle school participants attended group after school one day per week and were entered in a drawing to win a $50 iPod gift card as incentive for participation.

Pre- and Post-Intervention Measures

The Eating Attitudes Test (EAT-26). The EAT-26 (Garner, Olmsted, Bohr & Garfinkel, 1982) is a widely used self-report measure of symptoms and concerns characteristic of eating disorders. The measure contains 26 items that assess three factors: dieting, bulimia and food preoccupation, and oral control (Ocker, Lam, Jensen, & Zhang, 2007). The EAT-26 is an abbreviated version of the original Eating Attitudes Test (EAT; Garner & Garfinkel, 1979) and is considered a reliable, valid, and economical screening tool for assessing the risk of eating disorders. According to the authors, individuals who score 20 or more or answer "yes" to any of the critical behavioral screening questions are advised to complete an interview to determine if

they meet diagnostic criteria for ED. Scores on the EAT-26 were used in this study to establish a baseline of eating-relating functioning and to determine if additional assessment of eating symptoms was necessary. EAT-26 scores were also used to evaluate clinical change from pre to post-intervention. Reliable change using the EAT-26 was calculated using information provided by the test publisher, who offered a community sample mean of 9.9 (*SD* = 9.2) with a reliability coefficient of 0.83 (Garner, Olmsted, Bohr, & Garfinkel, 1982) and using the formulas provided by Jacobson & Truax (1991) for groups and individuals.

The Eating Disorder Examination-Questionnaire (EDE-Q). The EDE-Q is a self-report questionnaire used to assess disordered eating behavior and accompanying ideations. The questionnaire contains 36 items and examines the prevalence of AN, BN, BED and EDNOS symptoms. The EDE-Q has a seven-point, forced choice scale and offers a global score and scores for four subscales: *Shape Concern* (e.g., *Has your shape influenced how you think about (judge) yourself as a person?*), *Weight Concern* (e.g., *Have you had a definite fear that you might gain weight?*), *Eating Concern* (e.g., *Have you had a definite fear of losing control over eating?*), and *Restrained Eating* (e.g., *Over the past 28 days, on how many days have you eaten in secret?*). Participants respond to each item based on their subjective experiences or behavior using a response format of "not at all," "slightly," "moderately," or "markedly". Scores range from 0-6 on the EDE-Q and higher scores are associated with more severe disordered eating behaviors; scores above 4 considered clinically significant (Fairburn & Beglin, 1994; Peterson et al., 2007).

According to a recent study, internal consistency among 723 undergraduate women in the United States, aged 18 to 25 years, ranged from 0.78 for the *Eating Concern* subscale to 0.93 for

the *Shape Concern* subscale (Luce, Crowther, & Pole, 2008). Test-retest correlations were measured across two weeks and were found to be 0.81 for *Dietary Restraint*, 0.87 for *Eating Concern*, 0.92 for *Weight Concern*, and 0.94 for *Shape Concern*. The test-retest coefficients for frequency of key behaviors, such as binge eating, self-induced vomiting, and laxative misuse ranged from 0.57 to 0.70 (Luce, Crowther, & Pole, 2008). The temporal stability of the EDE-Q was validated in another study with a sample of Australian young women and test-retest coefficients using a two-month test-retest window. Results differed somewhat, with Mond, Hay, Rodgers, Own, & Beaumont (2004) offering slightly more conservative reliability estimates (N = 495): *Dietary Restraint* = 0.57, *Eating Concern* = 0.77, *Weight Concern* = 0.73, *Shape Concern* = 0.75, and *Global Scale* = 0.79 (Mond, Hay, Rodgers, Owen, & Beumont, 2004). This study used the more conservative reliability estimates provided by Mond, et al. (2004) for all reliable change index calculations.

Luce, Crowther, & Pole (2008) provided undergraduate norms from a sample of 723 college females: *Restraint* subscale *M (SD)* = 1.62 (1.54), *Eating Concern* subscale *M (SD)* = 1.11 (1.11), *Shape Concern* subscale *M (SD)* = 2.27 (1.54), *Weight Concern* subscale *M (SD)* = 1.97 (1.56), and *Global Score M (SD)* = 1.74 (1.30). As these differed from the 1994 young adult norms offered by Fairburn & Beglin, and given that no norms for middle or high school students have been published, the norms provided by Luce, Crowther, & Pole (2008) were used for reliable change calculations.

The Behavior Assessment System for Children, 2nd Edition (BASC-2). The BASC-2 (Reynolds & Kamphaus, 2004) was used to assess internalizing and externalizing symptoms and overall functional impairment. Both parents/guardians and adolescents completed the measure

pre and post-intervention and *t*-scores provided by the BASC-2 were used to evaluate general functioning and to guide selection of additional measurement tools, such as those for depression and anxiety, which are commonly comorbid with ED. Scores that fall above at or above 70 or at or below 30 are considered clinically significant and those that fall from 60-69 or 31-40 are considered "at risk." Scores between 41 and 59 are considered average.

When completing the BASC-2, parents were asked to read phrases describing how children may act and then rate their child's behavior over the last several months on a 4-point Likert scale. The parent-report version, BASC-2-PRS, includes the following scales: *Activities of Daily Living*, *Adaptability*, *Aggression*, *Anxiety*, *Attention Problems*, *Atypicality*, *Conduct Problems*, *Depression*, *Functional Communication*, *Hyperactivity*, *Leadership*, *Learning Problems*, *Social Skills*, *Somatization*, *Study Skills*, and *Withdrawal*.

The youth self-report of personality (BASC-2-SRP) was completed by the study participant. This form asks the adolescent to describe aspects of their perceptions and emotions using a true/false and 4-point Likert scale format. The self-report form includes scales for *Anxiety*, *Attention Problems*, *Attitude to School*, *Attitude to Teachers*, *Atypicality*, *Depression*, *Hyperactivity*, *Interpersonal Relations*, *Locus of Control*, *Relations with Parents*, *Self-Esteem*, *Self-Reliance*, *Sense of Inadequacy*, *Social Stress*, and *Somatization*.

Internal reliability of the BASC-PRS and SRP composite scales range from the low to mid .90s using coefficient alpha (De Los Reyes & Kazdin, 2004). There are also composite problem scales: the *Behavioral Symptoms Index* (BSI) for the PRS and the *Emotional Symptoms Index* (ESI) for the SRP. Reynolds and Kamphaus (2004) indicated that the BSI and ESI reflect the overall level of a child's or adolescent's problem behavior and recommended that these

overall composites be examined first when interpreting results. Reliable Change Index values were provided by the publishers of the BASC-2: for the PRS, the BSI value was 6.8 for youth aged 15-18 years and 6.2 for youth aged 12-14 years; for the SRP, the ESI value was 6.8 for youth aged 15-18 years and 6.2 for youth aged 12-14 years.

The Youth Outcome Questionnaire (YOQ). The YOQ (Burlingame et al., 2001) was used to measure the level of psychosocial distress the adolescent was experiencing pre and post-intervention, as reported by a parent or guardian. The measure contains 64 items that ask for a rating of observations of the adolescent's behavior in the last week on a 5-point scale. The Y-OQ (Burlingame et al., 2001, 2004, 2005) includes subscales for *Intrapersonal Distress*, *Somatization*, *Interpersonal Relations*, *Social Problems*, *Behavioral Dysfunction*, and *Critical Items*. The internal consistency estimate of the Total score is .95 for the Y-OQ and the test-retest reliability is estimated to be 0.81 (Burlingame et al., 2001). The Y-OQ has convergent validity with the Child Behavior Checklist (0.78; Burlingame et al., 2005), is able to predict membership in a clinical or normal population with average classification accuracy of 85%, and has demonstrated sensitivity to change over brief periods of time (Burlingame et al., 2001). Total raw scores on the Y-OQ range from -16 to 240 with clinically significant scores falling above 49. Test publishers have demonstrated the ability to classify improved and deteriorated cases with an RCI value of 13 on the YOQ.

Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI). Two additional measurement tools, the Beck Depression Inventory (BDI; Beck & Steer, 1993) and the Beck Anxiety Inventory, Youth (BAI; Beck, Epstein, Brown, & Steer, 1988) were administered to the high school students whose BASC-2 score profiles suggested at least a moderate degree of

anxiety or depression symptoms. These were administered pre and post-intervention to document and evaluate potential changes in specific symptoms of anxiety or depression that the BASC-2 may not be sufficiently sensitive to detect.

Treatment Integrity Measures. Treatment integrity was ensured by adhering as much as possible to the manualized DBT approach outlined by Linehan (1993a) in her text, *Cognitive-behavioral treatment of borderline personality disorder*, and the accompanying workbook, *Skills training manual for treating borderline personality disorder* (Linehan, 1993b). Each lesson was presented in the format described in that text, with slight modifications made to make the material accessible to adolescents, as outlined by Miller, Rathus, DuBose, Dexter-Mazza, & Goldklang, (2007). Photocopies from the DBT workbook (Linehan, 1993b) were used as teaching and activity materials during each group session and as homework. The sequence of skill development was modeled after other adolescent DBT interventions, with particular influence from Safer, Lock, & Couturier, (2007), whose case study offered detailed information about modifying a DBT intervention for adolescent ED. Lesson plans were developed in advance with content split across the twelve group sessions. These lessons were reviewed each week and followed to the greatest extent possible by the group facilitators. One role of the assistant group facilitator was to ensure that the material to be covered was done so with integrity, and she provided reminders or feedback to the primary facilitator, as needed. Any change from the lesson plans that occurred were noted in the lesson plans, so that replication of this intervention could be easily accomplished. A summary of the lesson plans for this intervention are included in Appendix A.

Social Validity Measures. Pre and post-intervention social validity (acceptability) measures were completed by all participants and caregivers, and by the high school teachers whose students left class in order to attend group. These forms were researcher created surveys modeled after the social validity forms developed by Lane & Beebe-Frankenberger (2004). Copies of these forms can be found in Appendix B.

Behavioral Measurement

In addition to completing pre and post-intervention measures, high school participants also tracked target behaviors (disordered eating and related behaviors identified in the initial assessment) and replacement behaviors (practice of DBT skills) throughout the study and for three weeks prior to the initiation of the intervention in order to establish a baseline of functioning. Behavior data was tracked using paper-and-pencil or mobile device tracking tools, including a mobile phone "app" and webpage synced with the researcher's *Evernote* software account. Participants were given the option to use either paper-and-pencil or mobile device tracking tools, and researchers collected this data electronically or in person each week. Participants were also sent daily text message reminders to help remind them to track behavioral data each day using an online program that sends scheduled text messages for free (*ohdontforget.com.*)

Intervention Procedure

High School Group. The high school participants in this study were evaluated using single case study methods and group summary statistics. Four participants attended weekly 1.5-hour DBT skills groups with two doctoral candidates trained in DBT. Participants were given permission to miss class in order to attend group one morning per week. Core skills modules of

Mindfulness, Interpersonal Effectiveness, Distress Tolerance, and Emotion Regulation were taught and practiced during group sessions. Participants completed weekly homework assignments that required them to practice skills. They also tracked target behaviors (disordered eating and related behaviors identified in the initial assessment) and replacement behaviors (practice of DBT skills) using paper-and-pencil or mobile device tracking tools, including a mobile phone "app" and webpage synced with the researcher's *Evernote* software account. Participants were sent daily text message reminders to remind them to track behavioral data each day.

The EAT-26 was administered twice over three weeks prior to initiation of the intervention to establish stability in eating-related symptoms. Following that, participants completed the following measures: BASC-2 (PRS and SRP), Y-OQ, EAT-26, and EDE-Q prior to participation in the DBT groups. Those showing elevated symptoms of anxiety and depression on the BASC-2-SRP also completed the BDI and BAI prior to the start of group participation. Following 12 weeks of the school-based DBT intervention, participants completed the EAT-26, EDE-Q, and the BASC-2 -SRP and parents/guardians completed the Y-OQ and BASC-2-PRS, all of which have been shown to be sufficiently sensitive to detect changes from treatment (Stice & Peterson, 2007; McClendon et al., 2011). Students who had taken the BDI and/or BAI prior to the intervention completed these measures again post-intervention.

Additional BASC-2-SRP, YOQ, EDE-Q, and EAT-26 data were collected at one-month and three-month follow-up to evaluate if gains from the study were maintained. One student was unable to have caregivers complete any of the post-intervention measures because she had moved out of her home while participating in the group and was no longer in contact with her

family. Two additional students, both seniors, moved out of their parents' home within two months of completing the study and therefore did not provide parent/guardian questionnaires at 3-month follow-up.

Two students who had signed up to be part of the intervention agreed to serve as control participants when they relocated and could no longer participate in the groups. Those participants completed the BASC-2-SRP, YOQ, EDE-Q, and EAT-26, and their parents/guardians completed the Y-OQ and BASC-2-PRS pre and post-intervention.

Middle School Group (Replication Group). The middle school group was treated as a replication group to evaluate the replicability of findings from the high school intervention group. Participants attended weekly 1.5-hour DBT skills groups with two doctoral candidates trained in DBT. The groups were held after school one day per week. Core skills modules of Mindfulness, Interpersonal Effectiveness, Distress Tolerance, and Emotion Regulation were taught and practiced during group sessions. Participants completed weekly homework assignments that required them to practice skills. Participants were sent daily text message reminders to help remind them to practice DBT skills using an online program that sends scheduled text messages for free (*ohdontforget.com.*)

All participants completed the following measures: BASC-2 (PRS and SRP), Y-OQ, and EAT-26 before participation in the DBT groups. Following 12 weeks of the school-based DBT intervention, participants completed the EAT-26, the BASC-2 -SRP and parents/guardians completed the Y-OQ and BASC-2-PRS, all of which have been shown to be sufficiently sensitive to detect changes from treatment (Stice & Peterson, 2007; McClendon et al., 2011).

CHAPTER 4

FINDINGS AND ANALYSIS

Design and Analyses

Given the small sample size of this study, an analysis called the Reliable Change Index (RCI; Jacobson, Folette, & Revensdorf, 1984) was used to evaluate individual and group summary statistics. The RCI lends itself well to small group studies, and offers a picture of clinical change from pre to post-intervention for individuals and groups. The RCI offers a formula for calculating clinically significant change that takes into account a measure's psychometric data (e.g., test-retest reliability, standard deviation) in evaluating clinically significant change.

A clinically significant change is said to have occurred when a score change from pre-test to post-test meets or exceeds the standard error of measurement of an instrument multiplied by 1.96 *and* the final score falls below the critical cutoff for clinically significant symptoms. For example, a clinically significant change on the EAT-26 is said to occur if a score is reduced by at least 15 points and the final score also falls below 20. These requirements ensure that score changes on a given scale are unlikely to occur by chance ($p<0.05$) and that an individual's final score is more like those of an individual without a disorder than those of one with a disorder. Table 2 below provides RCI score change values for the various measured used in this study and the correlated clinical cutoff scores.

Table 2

Reliable Change Values and Clinical Cutoff Scores for Select Measures

Measure	*Score Change*	*Cutoff Score*
EAT-26	15	19
Y-OQ	13	49
BASC-2 (ESI & BSI)	Ages 12-14: 6.2 Ages 15-18: 6.8	59
EDE-Q Global	1.17	2.01
EDE-Q Restraint	1.7	1.79
EDE-Q Eating Concern	0.81	1.00
EDE-Q Weight Concern	1.39	2.19
EDE-Q Shape Concern	1.51	2.74

The RCI was used to compare symptom improvements on the EDE-Q, Y-OQ, EAT-26, and the BASC-2 for a group of participants completing this DBT intervention. Furthermore, three of the four individuals who participated in the high school group were evaluated using single case methods, including analysis of slope and calculations of percentage of overlapping points. Slope is the rate of change over time and is calculated by subtracting the value at the end of measurement from the value at the start of measurement and dividing by the duration of the intervention. Slope can help to determine if change occurs during the course of intervention and if that progress is maintained following withdrawal of the intervention (Brown-Chidsey, Steege, & Mace, 2008). The percentage of overlapping data points is an effect size measure calculated by taking the range of behavior at baseline and determining the number of data points during

intervention that fall in that range as a ratio of the total number of data points collected during the intervention. In general, the lower the percentage of overlapping data points, the stronger the inference that can be made that a functional relationship exists between the intervention and the changes in target behavior (Alberto & Troutman, 2009).

Research Question One

This study sought to answer the following question: Will school-based DBT skills groups be an effective treatment modality for adolescent ED and sub-clinical eating symptoms?

To examine this question, the study employs both group and single case analyses.

Group Outcomes

Participation in school-based DBT skills group was associated with reductions in disordered eating behavior, namely episodes of purging and compensatory exercise, among those who reported clinically significant ED behavior at the start of the intervention. Participation in the intervention was also associated with improved functioning in select symptoms (e.g., anxiety, somatization) among participants with clinically significant symptoms in those domains at the start of treatment. Furthermore, caregivers reported reliable improvement in behavioral symptoms for participants with clinically significant problem behavior at the start of the intervention, as measured by the BASC-2-PRS and YOQ. Participation in the intervention was not associated with consistent improvements across all clinical domains, however, and results varied by individual and group. Notably, no improvement in any eating-related or other clinical domain was observed for the two control subjects who did not complete the intervention.

Table 3 provides scores on the EAT-26 for all participants at pre and post-intervention. Test publishers have indicated that a decrease of 15 points on the EAT-26 indicates a reliable

change in disordered eating symptoms. A clinical cutoff score of 19 was also provided by test makers (Garner, Olmsted, Bohr, & Garfinkel, 1982); therefore, participants had to achieve a score reduction of 15 points *and* score at or below 19 in order to show clinically significant improvement in ED symptoms, as measured by the EAT-26.

Table 3

Pre and Post-Intervention Scores on the EAT-26

Participant	*Group*[d]	*Pre-Intervention Score*	*Post-Intervention Score*	*RCI Value*
A	HS	45	21	4.48*
B	HS	27	8	3.60**
C	HS	3	1	0.37
D	HS	14	10	0.74
HS Group Mean		22.25	10	2.29*
E	MS	17	12	0.93
F	MS	3	5	-0.37
G	MS	2	3	-0.19
MS Group Mean		7.33	6.67	0.12
Treatment Group Mean		15.86	8.57	1.36
H	Control	10	12	-0.37
I	Control	24	22	0.37
Control Mean		17	17	0

[d]: HS = High School, MS = Middle School
*RCI values greater than 1.96 indicate reliable change. RCI scores were calculated using the formulas provided by Jacobson & Truax (1991) for individuals and groups and using psychometric data provided by test publishers.
**Score change meets standard for clinically significant change: score change exceeds the RCI value provided by test publisher (or is greater than 1.96) and post-treatment score falls below the clinical cutoff score provided by test publishers.

As illustrated in Table 3, both of the participants in the experimental condition whose EAT-26 scores fell in the clinical range at pre-intervention (score ≥20) made reliable

improvement at post-intervention. One participant (Student B) also showed clinically significant improvement in that her score was reduced by over 15 points and her final score fell below the clinical cutoff score of 19. Student A showed reliable improvement on the EAT-26, but her final score at post-treatment remained in the clinical range, suggesting the continued presence of clinical symptoms of ED. One of the control participants scored in the clinical range at pre-intervention and her score remained nearly stable at post-intervention, showing no reliable improvement over the intervention period.

The majority of study participants did not have pre-intervention EAT-26 scores in the clinical range, and therefore did not make reliable improvement from pre to post-treatment. Accordingly, group means for both experimental conditions were not significant using the reliable change value of 15 provided by test-makers. Notwithstanding, all of those with pre-intervention scores in the clinically significant range on the EAT-26 were in the high school group and the overall group mean for that group decreased substantially from pre to post-intervention (score change of 12.25; RCI value of 2.29), suggesting a reliable reduction in symptoms for the high school group overall.

This study relied upon a small sample with great variability in disorder eating symptoms and severity; therefore, group means may not be helpful for evaluating the impact of this treatment on ED symptoms. Accordingly, detailed case studies for the participants showing greater eating pathology are provided below.

Table 4 below contains pre and post-intervention scores for the *Emotional Symptom Index* (ESI) of the BASC-2-SRP. The ESI score is a global indicator of serious emotional disturbance, reflecting elevated reports of internalizing problems and low levels of personal

adjustment (Reynolds & Kamphaus, 2004). Test publishers for the BASC-2 offer a value of 6.2 (ages 12-14) and 6.8 (ages 15-18) points for indicating reliable change on the ESI. Scores that fall at or above 70 or at or below 30 are considered clinically significant and those that fall from 60-69 or 31-40 are "at-risk." Scores between 41 and 59 are considered average.

Table 4

Pre and Post-Intervention Scores for the BASC-2 SRP Emotional Symptoms Index (ESI)

Participant	*Group*[d]	*Pre-Intervention Score*	*Post-Intervention Score*	*RCI Value*
A	HS	80	76	1.18
B	HS	69	62	2.06*
C	HS	57	52	1.47
D	HS	48	46	0.59
HS Group Mean		63.5	59	1.33
E	MS	73	67	1.77
F	MS	56	54	0.59
G	MS	68	66	0.59
MS Group Mean		65.67	62.33	0.98
Treatment Groups Mean		64.43	60.43	1.18
H	Control	71	72	-0.29
I	Control	78	75	0.88
Control Mean		74.5	73.5	0.30

[d]: HS = High School, MS = Middle School
*RCI values greater than 1.96 indicate reliable change. RCI scores were calculated using the formulas provided by Jacobson & Truax (1991) for individuals and groups and using psychometric data provided by test publishers.
**Score change meets standard for clinically significant change: score change exceeds the RCI value provided by test publisher (or RCI greater than 1.96) and post-treatment score falls below the clinical cutoff score provided by test publishers.

As indicated in Table 4, two experimental participants had BASC-2-SRP ESI scores in the clinically significant range at pre-intervention (Students A and E) and two additional participants had scores in the at-risk range (Students B and G) on the ESI. Of those who began

in the at-risk or clinical ranges, only one student made a reliable improvement (Student B) on the ESI. Furthermore, at post-intervention, Student B's ESI score was approaching normality, but remained in the at-risk range. Two of the other three students showing elevated scores on the ESI showed improvement that approached the reliable change cutoff provided by test makers: Student A reduced her score by 4 points and Student E reduced hers by 6 points; however, both participants had scores that continued to be elevated at post-treatment. Notably, both control participants showed scores in the clinical range at the start and completion of the intervention, suggesting that they did not make improvements in symptoms of emotional disturbance during the intervention period.

All group means failed to reflect a reliable change in ESI symptoms; however, this study relied upon a small sample with great variability in emotional symptoms and severity; therefore, group means may not capture the impact of this treatment on symptoms of emotional disturbance. Accordingly, detailed case studies for selected participants falling in the clinical or at-risk range are provided below.

Table 5 below contains pre and post-intervention scores for the *Behavioral Symptom Index* (BSI) of the BASC-2-PRS. The BSI score is an indicator of the overall level of problem behavior and can be interpreted to represent general functioning and level of impairment, as reported by a caregiver (Reynolds & Kamphaus, 2004). Test publishers for the BASC-2 offer a value of 6.2 (ages 12-14) and 6.8 (ages 15-18) for indicating reliable change on the BSI. Scores that fall above at or above 70 or at or below 30 are considered clinically significant and those that fall from 60-69 or 31-40 are "at- risk." Scores from 41-59 are considered normal.

Table 5

Pre and Post-Intervention Scores for the BASC-2 PRS Behavioral Symptoms Index (BSI)

Participant	*Group*[d]	*Pre-Intervention Score*	*Post-Intervention Score*	*RCI Value*
A	HS	69	58	3.24**
B	HS	49	44	1.47
D	HS	50	53	-0.88
HS Group Mean		56	51.67	1.27
E	MS	68	60	2.36
F	MS	46	49	-0.88
G	MS	42	45	-0.88
MS Group Mean		52	51.33	0.19
Treatment Group Mean		51	51.5	-0.15
H	Control	70	68	0.59
I	Control	79	75	1.18
Control Mean		74.5	71.5	0.88

[d]: HS = High School, MS = Middle School
*RCI values greater than 1.96 indicate reliable change. RCI scores were calculated using the formulas provided by Jacobson & Truax (1991) for individuals and groups and using psychometric data provided by test publishers.
**Score change meets standard for clinically significant change: score change exceeds the RCI value provided by test publisher (or is greater than 1.96) and post-treatment score falls below the clinical cutoff score provided by test publishers.

As indicated in Table 5, only two of the study participants that completed the DBT intervention had elevated scores at pre-intervention (Students A and E). Both participants showed reliable improvement in their scores from pre to post-treatment and Participant A's score fell into the normal range at post-intervention, indicating a clinically significant change. Student E's score was nearly in the normal range, falling at 60. In contrast, both control participants showed scores in the clinical range at the start of the intervention; neither made reliable improvement over the course of the intervention period. Experimental group means did not

show reliable change for behavioral symptoms, in part due to a lack of participants with elevated scores at pre-intervention.

Table 6 below contains Y-OQ scores at pre and post-intervention for all study participants. According to test publishers, score reductions of 13 are considered reliable improvement, and scores above 49 are considered to fall in the clinical range (Burlingame, et al., 2001).

Table 6

Pre and Post-Intervention Scores for the Y-OQ

Participant	*Group*[d]	*Pre-Intervention Score*	*Post-Intervention Score*	*RCI value*
A	HS	63	50	1.74*
B	HS	52	29	3.08**
D	HS	70	73	-0.40
HS Group Mean		61.67	50.67	1.34
E	MS	58	50	1.07
F	MS	27	30	-0.40
G	MS	13	20	-0.94
MS Group Mean		32.67	33.33	-0.09
Treatment Group Mean		47.14	42	0.69
H	Control	70	72	-0.27
I	Control	92	89	0.40
Control Mean		81	80.5	0.20

[d]: HS = High School, MS = Middle School

*RCI values greater than 1.96 indicate reliable change. RCI scores were calculated using the formulas provided by Jacobson & Truax (1991) for individuals and groups and using psychometric data provided by test publishers.
**Score change meets standard for clinically significant change: score change exceeds the RCI value provided by test publisher (or is greater than 1.96) and post-treatment score falls below the clinical cutoff score provided by test publishers.

As demonstrated by Table 6, all of the high school participants in the experimental condition and one of the middle school participants scored in the clinical range on the Y-OQ at pre-treatment. Of those, two showed reliable change (Students A and B) and one showed clinically significant improvement on the Y-OQ (Student B). Student A's post-intervention score was approaching normality but remained just above the cutoff for the clinical range, with a score of 50 (49 is the cutoff for clinical significance). Both control subjects scored in the clinical range at pre and post-intervention, suggesting that they did not show reliable improvement over the course of the intervention period. Participant C was unable to provide caregiver reports at post-intervention due to lack of communication with previous caregivers.

Notably, Participant C was unable to provide caregiver reports at post-intervention due to persistent family conflict that resulted in her severing communication with her previous caregivers. Accordingly, caregiver scores are not reported below and were not included in calculations for group means or RCI calculations for caregiver report measures (BASC-2-PRS and YOQ).

Single Case Analyses

Because many of the students who joined the DBT intervention did not show clinically significant symptoms of disordered eating, and because the study sample was small, group data may be less meaningful than individual results (and replications of those results among participants with similar symptoms). Accordingly, three single case analyses are offered below.

Student A. Student A was a 17-year-old Caucasian female who was referred to the group by the school counselor. At the time of referral, she met the DSM-IV criteria for EDNOS. She regularly engaged in purging and non-purging compensatory behaviors following eating

relatively small amounts of food. Student A shared that she was diagnosed with a thyroid condition that made it difficult for her to lose weight. At the start of treatment, her BMI was 28.5, and she considered herself to be "fat." She was very fearful of gaining weight, avoided particular foods, experienced guilt after eating, and skipped meals regularly. She endorsed zero binge episodes in the month prior to participation in the intervention, but reported having vomited following meals approximately 15 times during that time. Student A also reported clinically significant symptoms of depression and anxiety. Specifically, she endorsed symptoms such as feeling sad, believing that her life was bad, frequently feeling like crying, feeling empty inside, feeling lonely, and difficulty sleeping.

Target Behaviors. Student A showed multiple significant disordered eating behaviors that she wished to change. The primary target behaviors identified were purging and dietary restriction/food avoidance, as these constituted self-injurious behaviors. Student A also weighed herself every day and reported a number of ED-related cognitions, such as thinking about her body and weight when she needed to be focused on something else, feeling sad about her weight, feeling guilty after eating, and feeling a strong desire to lose weight.

Student A's behavior was tracked for three weeks prior to administering the intervention. During that time, she reported a weekly average of 8.3 instances of avoiding eating when hungry, an average of 7 instances of avoiding a particular food group (fried food, bread, and desserts), and an average of 7.7 instances of vomiting after meals. She also weighed herself on average once per day. Student A reported thinking about her weight when she should be focused on something else an average of 5 times per week, felt sad about her weight an average of 42 times

per week, felt guilty after eating an average of 30 times per week, and felt a strong desire to lose weight an average of 15 times per week.

Treatment. Student A attended all sessions and tracked her disordered eating symptoms and DBT skill usage using paper-and-pencil forms created specifically for her target behaviors. She received twice-daily text message reminders to track her behavioral data for the first four weeks of the intervention, and then received reminders once per day. She reported no difficulty in completing the daily behavior tracking component of the program, and reported that the text messages were helpful as she developed the habit of tracking her target behaviors and DBT skill usage.

Outcomes. Figure 1 depicts the frequency of target and replacement behaviors (DBT skill usage) for student A before and during the intervention. It is apparent from the graph that Student A showed a stable baseline of target behaviors, including food restriction (operationalized as, "I avoided eating when hungry because of concern about my weight or shape,") food avoidance (operationalized as, "I avoided eating a particular type of food because of concern about my weight or shape,") weight concern (operationalized as, "I weighed myself on a scale to see if I had lost or gained weight,") and purge episodes (operationalized as, "I made myself throw up after eating due to concern about my weight or shape,") prior to the start of the intervention. The frequency of DBT skill usage (operationalized as, "I practiced a skill learned in DBT group,") was also tracked as a replacement behavior. The graph suggests that all of the target behaviors decreased and replacement behaviors increased following the introduction of the intervention.

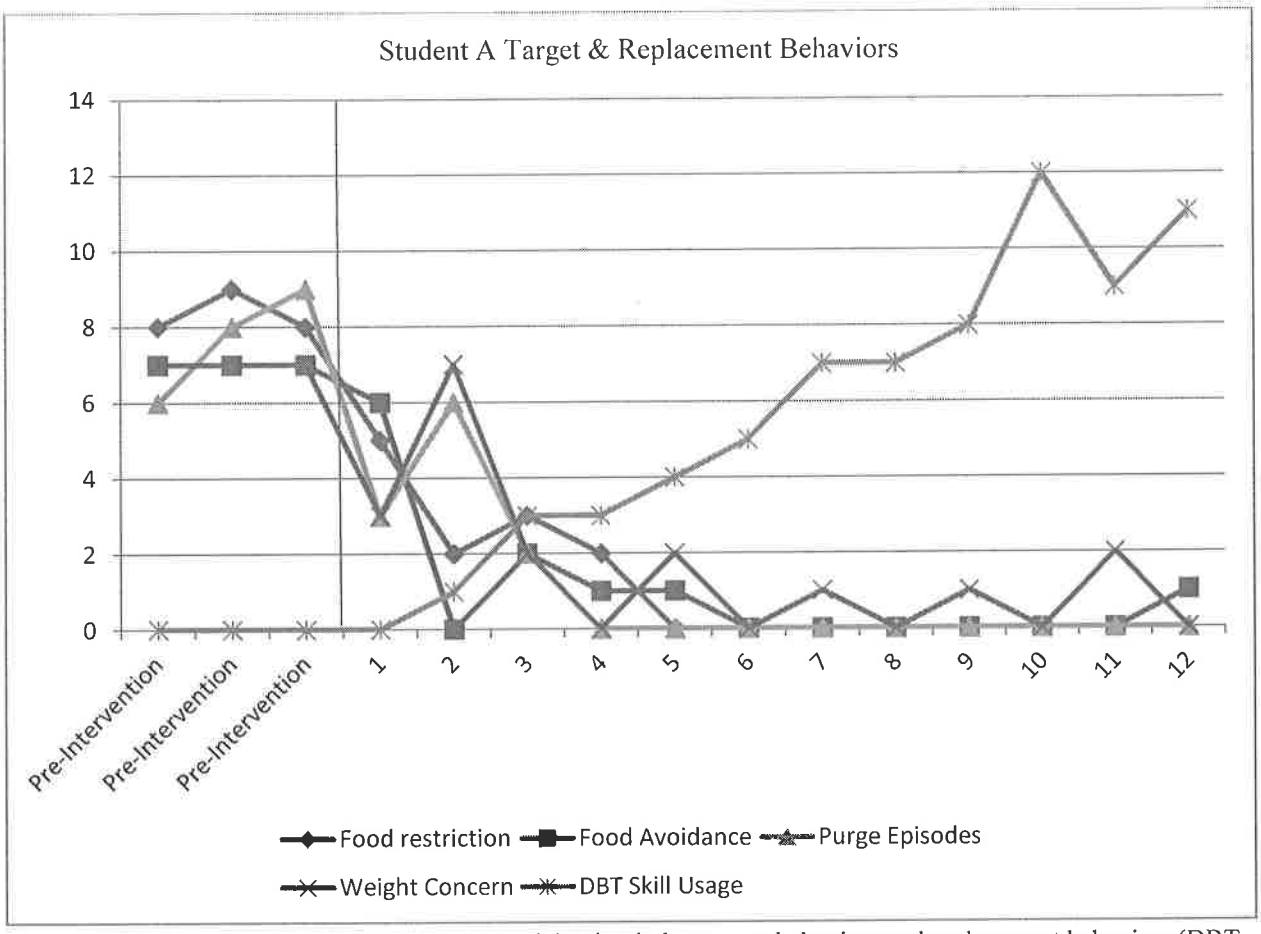

Figure 1. Student A's reported frequency of participation in key target behaviors and replacement behaviors (DBT skill usage).

Analysis of behavioral improvement was evaluated using slope and percentage of overlapping points calculations (see Table 7 below). Slope was calculated by subtracting the frequency of behavior reported during the final week from the frequency of the behavior reported in the week prior to intervention and dividing by the duration (12 weeks). All target behaviors show negative slopes, suggesting that the target behaviors decreased in frequency from the start to the end of treatment. The percentage of overlapping points was calculated using the formula offered by Alberto & Troutman (2009). The percentage of overlapping points is an effect size measure calculated by taking the range of behavior at baseline and determining the number of data points during intervention that fall in that range. The number is used as a ratio of the total

number of data points collected during the intervention. Student A's percentage of overlapping points was zero for food avoidance, food restriction, and DBT skill usage, suggesting a marked change following implementation of the intervention. The percentage of overlapping points for purging episodes and weight concern was 8.33, which is low enough to lend support to the hypothesis that participation in the school-based DBT intervention was associated with these improvements.

Table 7

Slopes and Percentage of Overlapping Points for Student A

Behavior	*Slope*	*% Overlapping Points*
Purging	-0.75	8.33
Food Avoidance	-0.50	0
Food Restriction	-0.58	0
Weight Concern	-0.58	8.33
DBT Skill Usage	0.92	0

In contrast to the behavior improvements described above, ED-related cognitions did not show improvement during or following participation in this intervention. Figure 2 below contains the frequency of Student A's ED-related cognitions and her DBT skill usage.

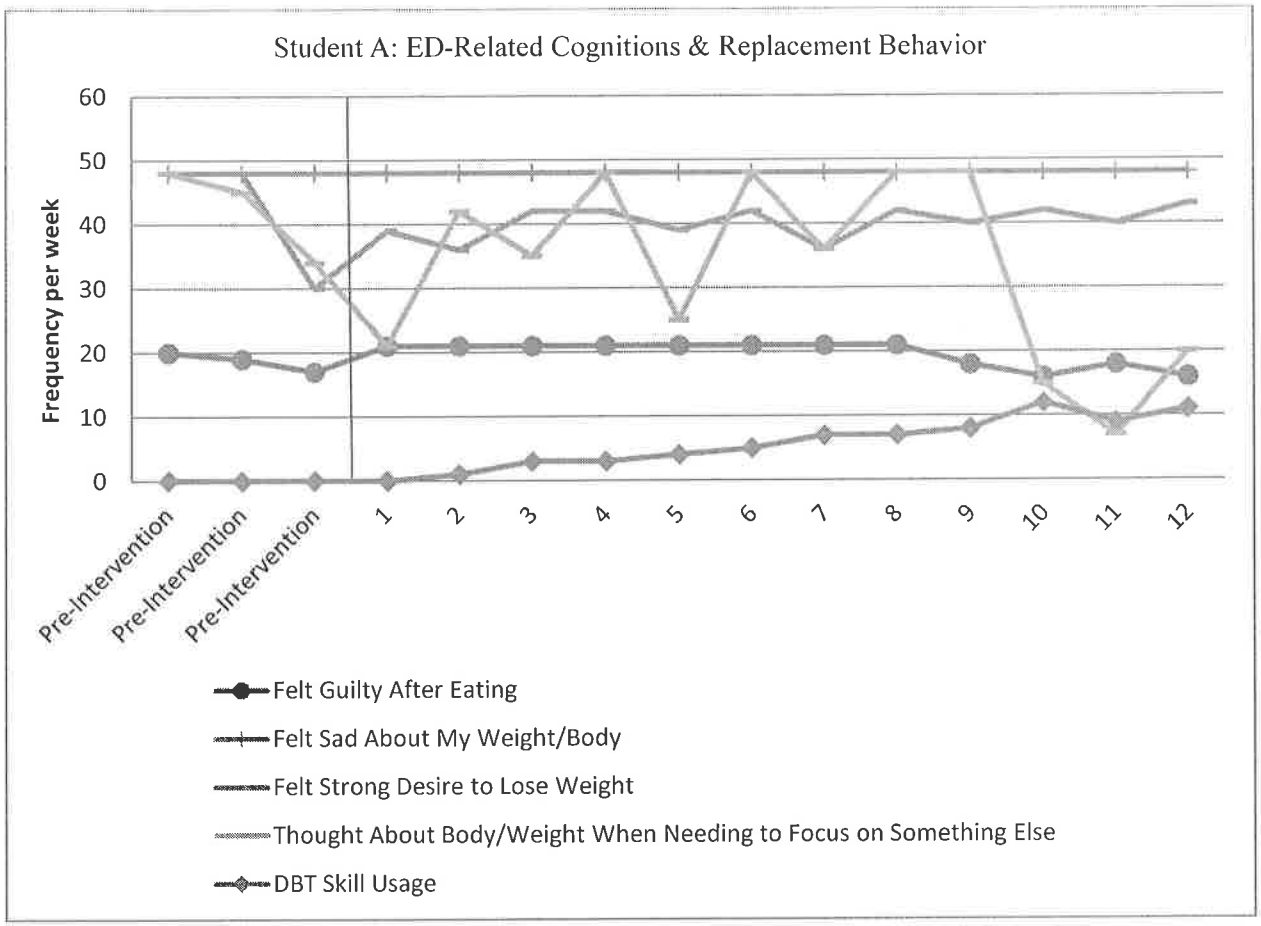

Figure 2. Student A's reported frequency of participation in eating disorder-related cognitions and replacement behaviors (DBT skill usage).

Figure 2 suggests that feelings such as guilt and sadness that are associated with body image disturbance and eating pathology were not improved following participation in the school-based DBT intervention. Similarly, Student A's desire to lose weight and preoccupation with her body and weight were not impacted by participation in this intervention. In fact, all ED-related cognitions were reported to be relatively stable prior to, during, and following the intervention. Notably, cognitions and feelings are not readily captured using discrete event recording. It is possible that Student A was not able to accurately report changes in cognitions and feelings because they were not as easily quantified as behavioral data (Kazdin, 1981). On the other hand, it's possible that cognitions may be more resistant to change and require longer intervention

periods in order to change; if so, and no changes in the frequency of ED-related cognitions took place, such refractory symptoms shed light on limitations to this intervention or suggest the need for additional treatment sessions or "booster" sessions.

Table 8 below contains values depicting the pre and post-intervention scores for Student A on the BASC-2 PRS and SRP (only scores falling in or approaching the clinical range at pre-intervention are included), EAT-26, EDE-Q, Y-OQ, BDI, and BAI.

Table 8

Pre and Post Intervention and Follow-Up Scores for Student A

Measure	*Scale*	*Pre Score (%ile)*	*Post Score (%ile)*	*Score at 1-month f/up*	*Score at 3-month f/up[a]*
BASC-2 PRS	Behavioral Symptoms Index**	69 (95)	58 (82)	59 (84)	
	Depression	60 (85)	66 (93)	62 (88)	
	Somatization**	65 (92)	57 (81)	58 (80)	
	Hyperactivity**	69 (94)	55 (75)	59 (86)	
BASC-2 SRP	Emotional Symptoms Index	80 (99)	76 (99)	73 (97)	92 (99)
	School Problems	66 (93)	62 (88)	60 (84)	80 (99)
	Internalizing Problems	80 (99)	77 (99)	78 (99)	91 (99)
	Attitude to Teachers	64 (91)	67 (94)	67 (94)	80 (99)
	Sensation Seeking**	71 (98)	42 (22)	42 (22)	66 (94)
	Locus of Control	71 (96)	87 (99)	80 (99)	87 (99)

Table 8, cont'd.

Measure	*Scale*	*Pre Score (%ile)*	*Post Score (%ile)*	*Score at 1-month f/up*	*Score at 3-month f/up[d]*
	Social Stress	65 (91)	65 (91)	65 (91)	96 (99)
	Anxiety*	83 (99)	70 (97)	70. (97)	81 (99)
	Depression	90 (99)	90 (99)	88 (99)	92 (99)
	Sense of Inadequacy*	74 (98)	65 (91)	65 (91)	86 (99)
	Somatization*	84 (99)	72 (96)	75 (98)	72 (96)
	Hyperactivity	64 (91)	64 (91)	64 (91)	77 (99)
	Self Esteem	18 (1)	23 (2)	25 (3)	18 (1)
EAT-26	Total Score*	45	21	22	28
Y-OQ	Total Score*	63	50	50	
BDI	Total Score	23	26	25	30
BAI	Total Score	14	15	13	14
EDE-Q	Restraint**	6	2.2	2.6	1.4
	Weight Concern	4.8	5.2	4.6	5.8
	Shape Concern	5.4	5.5	5.3	5.9
	Eating Concern	2.8	4.0	3.0	4.0
	Global Score	4.7	4.5	4.3	4.5
	# Days binge episodes Occurred	0	10	5	6

Table 8, cont'd.					
Measure	*Scale*	*Pre Score (%ile)*	*Post Score (%ile)*	*Score at 1-month f/up*	*Score at 3-month f/up[d]*
	Purge Episodes	15	0	0	0
	Laxative Use	0	2	0	0
	Compensatory Exercise Days	28	10	10	10

*Indicates a reliable change from pre to post-intervention using the RCI
**Indicates a clinically significant change from pre to post-intervention using the RCI
[d] Parent data was not available at 3-month follow-up due to participant living independently

The data in Table 8 suggests that Student A made improvements in several psychological and behavioral domains following participation in this intervention. With regard to disordered eating behavior, Student A reduced her overall score on the EAT-26 score from 45 to 21, signifying a reliable change in symptoms associated with ED, although her post-intervention score remained above the clinical cutoff score of 19 offered by test publishers. This suggests that Student A made significant improvements in her overall disordered eating behaviors and concerns, but that her score continues to be more similar to that of a clinical population than to that of a normal population upon completion of the program and through one and three-month follow-up.

Student A also showed a clinically significant change in her endorsement of behavioral dietary restraint on the EDE-Q. Her *Dietary Restraint* score went changed 6 to 2.2, an RCI of 5.38 ($p < 0.0001$). Other areas measured by the EDE-Q, such as *Eating Concern*, *Shape Concern*, and *Weight Concern*, did not appear to improve following the intervention. Behavioral

symptoms measured on the EDE-Q did show improvement, however: purge episodes were reduced to zero following the intervention, and these gains continued at one and three month follow-up. Instances of compensatory exercise were also reduced from every day at pre-intervention to 10 days in the month following the intervention.

Other indicators of overall psychological functioning were measured using the BASC-2, Y-OQ, BAI, and BDI. Student A showed reliable improvement in the following subtest scores on the BASC-2 SPR: *sensation seeking*, *anxiety*, *sense of inadequacy*, and *somatization*, although scores on all of the subtests except *sensation seeking* remained elevated at post-treatment assessment. These findings suggests that Student A's symptoms improved over the course of the intervention, but remained significant concerns upon completion of the intervention.

Student A's caregiver reported clinically significant improvements in scores on the *Behavioral Symptoms Index*, *somatization*, and *hyperactivity* on the BASC-2 PRS, suggesting that she perceived her daughter's functioning in these areas to be normal upon completion of the intervention. Student A's caregiver also completed the Y-OQ and her responses indicated a reliable change in symptoms measured by that index, including symptoms of *interpersonal distress*, *somatization*, and *behavioral dysfunction*. Caregiver and student reports converged to suggest that Student A showed an overall reduction in behavioral symptoms of distress and somatization; however, Student A indicated a greater overall degree of impairment and distress than did her caregiver.

Interestingly, while Student A reported reductions in symptoms of anxiety measured by the BASC-2 SRP, she did not endorse reductions in symptoms of anxiety as measured by the BAI. In fact, Student A's score on the BAI at the start of the intervention fell in the lowest score

category (Mild Anxiety), but her score for Anxiety on the BASC-2-SRP fell at the 99th percentile. A review of the literature on these two measures offered little clarity regarding why this effect would occur; however, an inspection of anxiety items contained on the BASC-2-SRP and on the BAI was revealing. Specifically, BASC-2-SRP items focus exclusively on the presence of worries and fears (e.g., Ï worry a lot of the time," and "I worry about what is going to happen,") while the majority of BAI items are designed to capture somatic symptoms of anxiety, such as trembling hands, racing heart, and difficulty breathing. Thus, although they both measure anxiety, they do so by asking very different questions. The BASC-2 anxiety items predominantly target worry, nervousness, and fears, with no questions about somatic symptoms of anxiety reflected in the BASC-2 anxiety score. In contrast, 14 of the 21 items on the BAI address somatic symptoms of anxiety, while only 4 address fears (two address the specific fears of dying and losing control), and one addresses feeling nervous. Only one item overlaps on the two scales: a statement about not being able to relax. Therefore, it's likely that Student A showed elevated scores for Anxiety on the BASC-2SRP and not on the BAI at the start of the intervention due to the presence of cognitive, rather than somatic, symptoms of anxiety. Furthermore, because Student A scored in the Mild Anxiety range on the BAI at the outset of the intervention, score reductions on this measure would not have been interpretable.

Student A also showed elevations in BASC-2-SRP composite scores related to internalizing problems, such as the *Internalizing Problems Index* and the *Emotional Symptoms Index* that did not improve over the course of the intervention. Student A's *depression*, *anxiety*, and *somatization* scores all remained elevated following participation in this intervention,

suggesting that while some improvement occurred, Student A's internalizing symptoms persisted and additional intervention is likely warranted.

Acceptability. Student A, her caregiver, and her teacher all completed pre and post-intervention social validity measures. Prior to the start of the intervention, Student A completed a pre-intervention social validity measure. At that time, she indicated that she believed participation in this intervention would be easy to stick with, be approved of by her parents, would not interfere with her schedule, would teach important skills, would improve her ability to focus on schoolwork, would not interfere with schoolwork, and would be okay with her teacher. She indicated neutral expectations about the possibility the program would improve her self-confidence or have lasting, positive effects.

Following the intervention, Student A reported that the treatment was easy to stick with, was approved of by her parents, taught important life skills, and would be something she would do again and would recommend to friends. She indicated that the intervention did not improve her self-confidence and had no impact on her schoolwork or grades.

Prior to the start of the intervention, Student A's caregiver indicated that she believed participation would be easy for her daughter to stick with, would be appropriate given the problem, would be suitable given their family values, would have lasting positive effects, would improve her daughter's self-confidence, would not interfere with school work, and would not result in lower grades. She indicated a neutral stance (did not agree or disagree) on whether the program would teach important skills or help her daughter focus on schoolwork. Following the intervention, she indicated that the intervention was easy for her daughter to stick with and did not interfere with school work or result in lower grades. She ranked the following statements

about the intervention neutrally: taught important skills, was appropriate given the problem, was suitable given our family values, improved my daughter's social skills, will have lasting positive effects, and improved my child's self-confidence.

Prior to the start of the intervention, Student A's teacher reported neutral expectations that the program would teach important skills, be suitable for the classroom culture, improve the student's social skills, have lasting positive effects, and would improve the student's focus on schoolwork. She indicated disagreement that the intervention would not interfere with her class schedule, would not take additional time for her, and would not interfere with school work. Following participation in the program, Student A's teacher reported that participation in the program interfered with her class schedule and created additional work for both student and teacher. Student A's teacher indicated her perception that the program improved Student A's social skills, taught important skills, and had lasting positive effects, but felt that participation interfered with Student A's academics, including interfering with the class schedule, taking extra time for her, and resulting in lower grades.

Generalization and Maintenance. Student A's scores on post-intervention measures and measures scored at one-month follow-up suggested that all of the gains experienced during the course of this intervention were maintained for at least one month following completing of participation. She also maintained gains in multiple eating-related domains at three-month follow-up. For example, Student A's EAT-26 score went from 45 at pre-intervention to 21 at post-intervention to 22 at one-month follow-up to 28 at three-month follow-up. This score continues to constitute a reliable improvement, despite the increase from post-intervention to three-month follow-up. Student A also continued to abstain from purging for at least three

months following the intervention and had not increased her compensatory exercise from her reported levels at post-intervention. Additionally, her score on the *Restraint* scale of the EDE-Q continued to go down following the intervention and had reduced from 6 at pre-intervention to 1.4 at three-month follow-up. As these were the primary behavioral targets set for Student A as part of this intervention, and these were classified as self-injurious behaviors, one can conclude that Student A maintained significant gains following participation in this intervention.

However, Student A did not maintain other gains, and in fact reported elevations at three-month follow-up that exceeded her pre-intervention scores in certain domains. For example, her score on the *Eating Concern* scale rose from 2.8 (pre-intervention) to 4.0 (three-month follow-up), her *Weight Concern* score went up from 4.8 (pre-intervention) to 5.8 (three-month follow-up), and *Shape Concern* increased from 5.4 (pre-intervention) to 5.9 (three-month follow-up). Additionally, her score on the ESI of the BASC-2-SRP went from 80 at pre-intervention to 92 at three-month follow-up. Within that index, she reported scores that exceeded her pre-intervention scores on *school problems*, *Internalizing Problems Index*, *attitude to teachers*, *locus of control*, *social stress*, *depression*, *sense of inadequacy*, and *hyperactivity*. Furthermore, Student A's score on the *anxiety* scale had made a clinically significant change from pre-intervention to post-intervention, but she did not maintain these gains at three-month follow-up.

Out of concern, the researcher contacted Student A following receipt of her follow-up self-report questionnaires. Student A reported that she had moved out of her parents' home approximately one month after graduating from high school, as planned. She had intended to spend a year saving money and working before attending college. She had found a job as a secretary in a nursing home, but lost her job shortly after signing a 6-month lease on an

apartment. She had not since found a new job and was experiencing financial stress related to that and concerns that she would not be able to attend college on the timeframe she had planned. She also reported stress with a new roommate and feelings of frustration and hopelessness. The researcher provided Student A with the name of several community resources that offer affordable mental health services and encouraged her to contact them in order to receive support during this time of stress and transition. Student A indicated that she would contact the providers and would follow-up with the researcher afterward.

Student B. Student B was a 17 year-old female with high levels of body shape and weight dissatisfaction. At the start of treatment, Student B had a BMI of 21.0 and reported fear about becoming overweight, food avoidance when hungry, a preoccupation with being thinner and having fat on her body, a focus on losing weight while exercising, and daily compensatory exercising with the intention of losing weight. She reported infrequent binging (5 episodes in the month prior to the intervention) and no instances of purging, but exercised daily for an average of 60 minutes in a "driven" or "compulsive" way as a means of controlling her weight, shape, or amount of fat (EDE-Q Item 18).

At pre-treatment, Student B showed clinically significant symptoms of anxiety, including near-constant worry, feeling nervous about the future, fear of making mistakes, and worry she might go crazy. Student B also endorsed significant symptoms of depression, including feeling like a bad person, difficulty sleeping, feeling unloved, feeling responsible for bad things that happen, feeling empty, feeling sad, and wanting to be alone.

Target Behaviors. The primary target behavior identified for Student B was compensatory exercise, which she engaged in daily and which constituted self-injurious

behavior. Student B also felt guilty after eating, avoided eating when hungry, felt a strong urge to lose weight, and daily thought about her weight/body when she needed to be focused on other tasks. All of these behaviors were tracked daily starting three weeks prior to the start of the DBT skills training program.

Treatment. Student B attended all sessions and initially tracked her disordered eating symptoms and DBT skill usage using the mobile "app" created for tracking such behaviors. She received twice-daily text message reminders to track her behavioral data throughout the course of the intervention. She reported no difficulty in completing the daily behavior tracking component of the program, and reported that the text messages were helpful as she developed the habit of tracking her behavior daily.

Outcomes. Figure 3 below depicts the weekly duration of compensatory exercise reported by Student B prior to and during the intervention. Mean bars were added to illustrate the change in average time of compensatory exercise from pre-intervention (mean of 440 minutes per week) to during the intervention period (mean of 250 minutes per week).

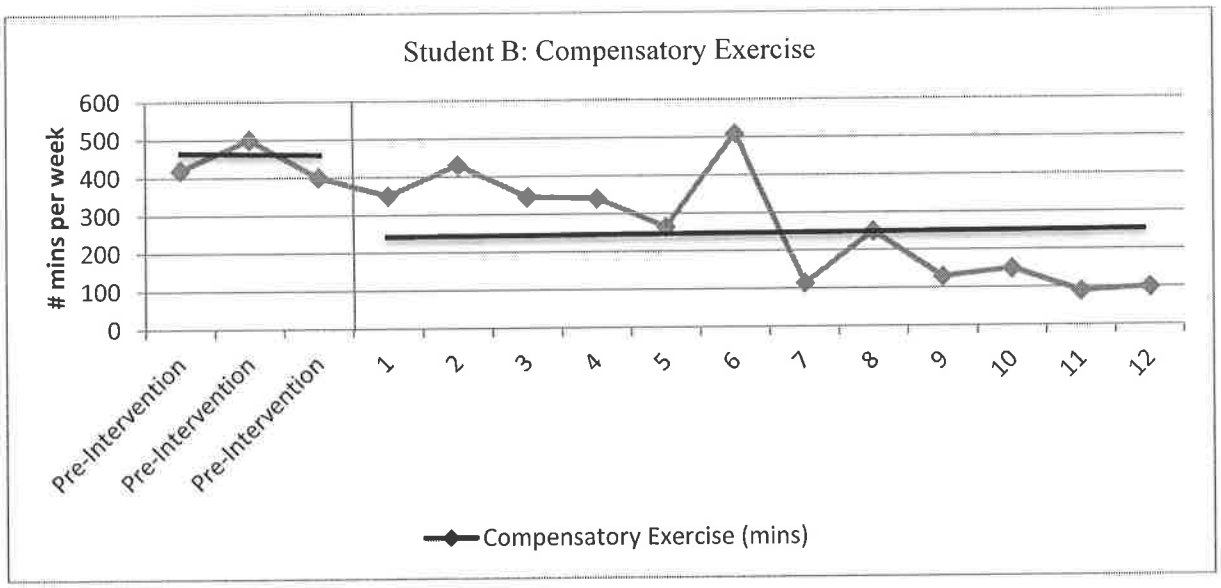

Figure 3. Minutes per week spent engaging in compensatory exercise by Student B.

It is apparent from the graph that Student B showed a stable baseline of compensatory exercise (operationalized as, "Engaged in exercise in a driven or compulsive way as a means of losing weight or reducing fat on the body") prior to the start of the intervention. DBT skill usage is not included on the graph due to the scaling of the y-axis, but is included in Figure 4. The data in Figure 3 suggests that compensatory exercise decreased over the course of the treatment.

Figure 4 below depicts the frequency of Student B's other target behaviors and DBT skill usage prior to and during the DBT intervention.

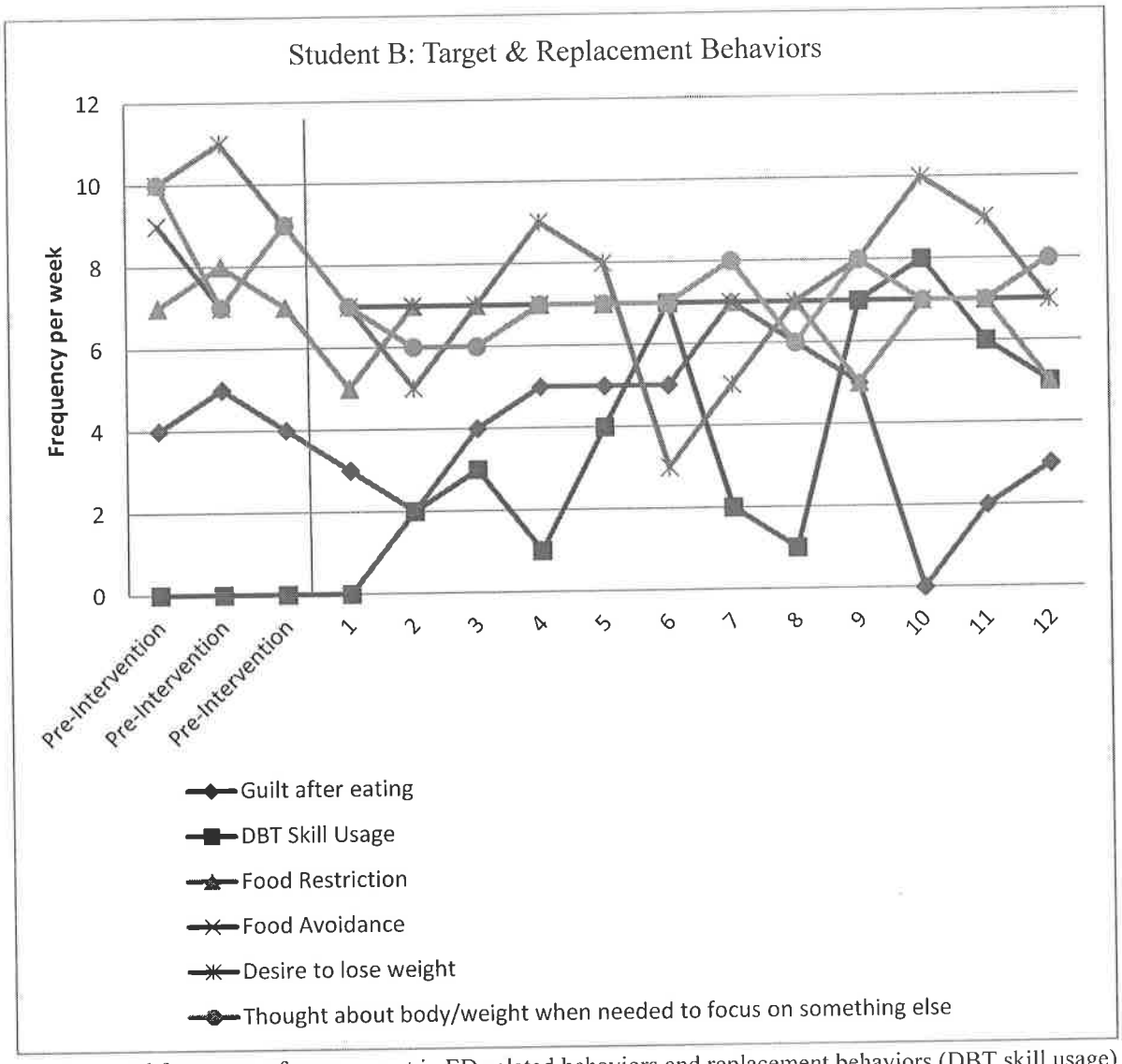

Figure 4. Reported frequency of engagement in ED-related behaviors and replacement behaviors (DBT skill usage) by Student B.

It is apparent from the graph that Student B showed a relatively stable baseline of target behaviors, including guilt after eating (operationalized as, "felt guilty after eating due to concern about gaining weight or getting fat,") food restriction (operationalized as, "I avoided eating when hungry because of concern about my weight or shape,") and food avoidance (operationalized as, "I avoided eating a particular type of food because of concern about my weight or shape,") prior to the start of the intervention. The frequency of DBT skill usage (operationalized as, "I

practiced a skill learned in DBT group,") was also tracked as a replacement behavior and showed stability prior to implementing the treatment.

Table 9 contains values for slope and percentage of overlapping points for Student B's target and replacement behaviors, including compensatory exercise. Target behaviors all had negative slopes, suggesting some trend toward decreasing; however, the data showed significant variability and the percentage of overlapping points suggests that many behaviors continued at or returned to their initial level of frequency into the intervention period. The calculations of slope and percentage of overlapping points for DBT skill usage suggests that DBT skill usage increased over the course of the intervention, with zero overlapping points and a positive slope.

Table 9

Slopes and Percentage of Overlapping Points for Student B

Behavior	*Slope*	*% Overlapping Points*
Compensatory Exercise	-25	8.33
Guilt after eating	-0.08	41.67
Food restriction	-0.17	75.00
Food Avoidance	-0.17	100
Felt a desire to lose weight	-0.17	25.00
Thought about body/weight needed to be focused on something else	-0.08	75.00
DBT Skill Usage	0.42	0

Table 10 below contains values depicting the pre and post-intervention scores for Student B on the BASC-2 PRS and SRP (only scores falling in or approaching the clinical range at pre-intervention are included), EAT-26, EDE-Q, Y-OQ, BDI, and BAI.

Table 10

Pre and Post-Intervention and Follow-up Scores for Student B

Measure	*Scale*	*Pre Score (%ile)*	*Post Score (%ile)*	*Score at 1-month f/up*	*Score at 3-month f/up[d]*
BASC-2 PRS	Internalizing Problems**	60 (85)	42 (22)	40 (13)	
	Anxiety**	66 (93)	45 (34)	44 (29)	
	Somatization**	62 (89)	47 (50)	47 (50)	
BASC-2 SRP	Emotional Symptoms Index*	69 (95)	62 (88)	60 (84)	59 (82)
	Internalizing Problems**	71 (97)	59 (83)	58 (80)	56 (74)
	Atypicality	72 (95)	72 (95)	72 (95)	74 (96)
	Anxiety*	81 (99)	70 (97)	68 (95)	68 (95)
	Somatization**	66 (91)	39 (7)	45 (39)	48 (52)
	Self Esteem	25 (3)	30 (5)	30 (5)	33 (7)
EAT-26	Total Score**	27	8	9	10
Y-OQ	Total Score**	52	29	29	27
BDI	Total Score	22	20	21	20
BAI	Total Score	30	31	29	31
EDE-Q	Restraint	3	2.0	2.1	2.4
	Weight Concern	4.8	4.2	4.2	4.1
	Shape Concern	5.5	4.75	4.5	4.4
	Eating Concern**	2.0	0.8	1.0	0.9

Table 10, cont'd.

Measure	*Scale*	*Pre Score (%ile)*	*Post Score (%ile)*	*Score at 1-month f/up*	*Score at 3-month f/up[d]*
	Global Score**	4.17	3.14	3.0	
	# Days binge episodes occurred	5	2	0	
	Purge Episodes	0	0	0	
	Laxative Use	0	0	0	
	Compensatory Exercise Days	27	0	0	

*Indicates a reliable change from pre to post-intervention using the RCI
**Indicates a clinically significant change from pre to post-intervention using the RCI
[d] Parent data was not available at 3-month follow-up due to participant living independently

The data in Table 10 suggests that Student B made clinically significant improvements in several domains following participation in this intervention. With regard to disordered eating behavior, Student B reduced her overall score on the EAT-26 score from 27 to 8, signifying both a reliable and a clinically significant change. Student B's post-intervention EAT scores were below the clinical cutoff scored offered by the publishers of the EAT-26, suggesting that her disordered eating behavior and cognitions following participation in this intervention were more similar to that of a non-clinical population than to a clinical population.

Student B also showed a clinically significant change in her EDE-Q Global Score and the EDE-Q *Eating Concern* subscale score. Her scores on all of the other subscales also decreased, but the magnitude of change was not sufficient in magnitude to be considered reliable using the

RCI. Behavioral indicators of eating disorders, such as compulsive daily compensatory exercise, also reduced markedly, from daily engagement prior to the intervention to no instances following the intervention. Student B's infrequent binge episodes were also reduced during and following the intervention.

Other indicators of overall psychological functioning were measured using the BASC-2, Y-OQ, BAI, and BDI. Student B showed clinically significant reductions in the following subtest scores on the BASC-2 SPR: *Emotional Symptoms Index*, *Internalizing Problems Index*, *anxiety*, and *somatization*. Student B's caregiver also reported clinically significant reductions in scores on the *Internalizing Problems Index*, *somatization*, and *anxiety* on the BASC-2 PRS. Student B's caregiver also completed the Y-OQ, and her responses indicated a clinically significant reduction in symptoms measured by that index, including symptoms of *interpersonal distress*, *somatization*, *social problems*, and *behavioral dysfunction*.

Similar to what was observed for Student A, while student B reported reductions in symptoms of anxiety measured by the BASC-2 SRP, she did not endorse reductions in symptoms of anxiety as measured by the BAI. In this case, Student B had scored in the Moderate Anxiety range on the BAI prior to beginning the intervention, and therefore a score decrease on this measure would have been meaningful. However, as was described above, the BAI and BASC-2-SRP anxiety items show little overlap; therefore, this researcher hypothesized that these differences in outcome measures are meaningful. That is, Student B reported a reduction in cognitive symptoms of anxiety but no such improvement in somatic symptoms.

One possible explanation for this finding could be that, if the majority or a large proportion of the content of Student B's worries or fears at pre-intervention were related to her

weight/body, then perhaps she experienced significant reductions in ED-related worries associated with her improvement in ED-related behaviors. As she learned a variety of adaptive strategies for handling her worries about gaining weight, she may have found that her worries/fears seemed less overwhelming and frequent, despite the continued presence of uncomfortable physical symptoms associated with anxiety. If true, then, although results suggest that Student B perceived a decrease in overall frequency of worries following completing of this intervention, it is possible that the treatment was not sufficiently comprehensive to result in improvements across the spectrum of anxiety symptoms.

DBT and other mindfulness-based treatment approaches emphasize building self-awareness in order to recognize the experience of emotions and handle them more skillfully. This means bringing attention to the physical and mental experiences of life. Therefore, another possible explanation is that Student B actually became more aware of her somatic symptoms over the course of treatment, thanks in part to the emphasis on self-awareness central to this intervention. If so, even if such symptoms showed improvement, she may have rated the overall severity or frequency of such symptoms as greater due to increased self-awareness. However, if this were the case, one might expect her to show a similar pattern of reporting for cognitive symptoms of anxiety, as measured by the BASC-2-SPR.

A final explanation offered here is that the BASC-2-SPR and BAI were measuring different clinical content for Student B. For example, Student B may have additional somatic concerns that are unrelated to anxiety that happen to overlap with those measured by the BAI. Student B and her mother both reported elevated *somatization* scores prior to the start of this intervention and another medical condition or physical feature unique to Student B could explain

the presence of somatic symptoms, such as shakiness, feeling lightheaded, and numbness or tingling, that were endorsed on the BAI. However, if this were the case, one would expect Student B's score on the *somatization* scale of the BASC-2 to remain elevated similarly to the BAI at post-intervention; however, as reported above, these scores showed clinically significant improvement according to both Student B and her mother.

Notwithstanding these unresolved questions regarding Student B's seemingly contradictory improvement on the anxiety symptoms measured by the BASC-2 but not the BAI, caregiver and student reports converged to suggest that Student B showed an overall reduction in behavioral and emotional symptoms of distress, markers of anxiety, and somatization.

Acceptability. Student B, her caregiver, and her teacher completed pre and post-intervention social validity measures. Prior to the intervention, Student B reported her expectation that the program would be easy to stick with, would be approved of by her parents, would not interfere with her schedule, would teach important skills, would be okay with her teacher, would improve her ability to focus on school work, and would not interfere with school work. She offered neutral ratings for her expectations that the intervention would improve her self-esteem or have lasting positive effects. Following participation in the intervention, Student B reported that the treatment was approved of by her parents, was okay with her teacher, taught important life skills, and would be something she would do again and recommend to friends. She neither agreed nor disagreed with the following: improved my self-confidence, will have lasting positive effects, improved my ability to focus on schoolwork, helped me want to stay in school, and resulted in better grades.

Prior to the intervention, Student B's caregiver indicated her expectation that the program would not teach important skills, would not be appropriate given the problem, would not be suitable given their family values, would not improve her daughter's social sills, would not help her daughter focus on school work, and would not improve her daughter's self-confidence. She indicated an expectation that the program would be easy for her daughter to stick with, would not interfere with school work, and would not result in lower grades. She indicated a neutral expectation about whether or not the program would result in lasting positive effects. Following her daughter's participation in the DBT program, Student B's caregiver reported that the intervention was suitable for her family values, did not result in lowered grades, and did not interfere with school work. She neither agreed nor disagreed with the following statements about the intervention: was easy for my daughter to stick with, taught important skills, was appropriate given the problem, improved my daughter's social skills, had lasting positive effects, improved my child's self-confidence, and helped her focus on schoolwork.

Prior to the start of the intervention, Student B's teacher reported positive expectations that the program would teach important skills, and neutral expectations that the program would be suitable for the classroom culture, improve the student's social skills, have lasting positive effects, and would improve the student's focus on schoolwork. She indicated disagreement that the intervention would not interfere with her class schedule, would not take additional time for her, and would not interfere with school work. After completion of the intervention, Student B's teacher reported that her student's participation in the program interfered with her class schedule and created additional work for both the student and teacher. She indicated her perception that

the program improved Student B's social skills, taught important skills, and had lasting positive effects, but felt that participation interfered with Student B's academics.

Generalization and Maintenance. Student B's scores on post-intervention measures and measures scored at one and three-month follow-up suggest that the gains experienced during the course of this intervention were maintained for at least three months following completing of participation. None of the scores measured at post-treatment were significantly different than those measured at one and three month follow-up, suggesting that Student B maintained her improved functioning even as she has encountered significant life transitions, such as leaving home and starting college.

Student C. Student C was an 18 year-old Caucasian female with few reported symptoms of disordered eating at the outset of the intervention. For example, student C reported that she rarely skipped meals when hungry and did not endorse fear of weight gain, preoccupation with her weight/body, or have elevated scores on the EAT-26 or EDE-Q. Student C did suffer from clinically significant symptoms of anxiety, such as frequent stomach aches, feeling nervous, fear about making mistakes, worry about people getting angry at her, feeling shaky, and difficulty sleeping. At the outset of treatment, Student C reported a high degree of interpersonal distress, including family discord and alienation from her birth parents. These stresses continued throughout the course of the intervention and, several weeks before the end of the program, Student C moved out of her home and into a women's shelter near her high school.

Treatment. Student C attended all sessions and initially tracked behavioral symptoms and DBT skill usage using the online website created for tracking such behaviors. She switched to paper-and-pencil forms after 4 weeks when her computer usage at home was reduced. Student

C also had her phone taken away by her teacher as a punishment for unapproved usage in school about halfway through the intervention. Initially, she received twice-daily text message reminders to track her behavioral data, but was unable to receive these reminders after losing her phone. After that, the researcher emailed her caregivers a weekly reminder asking them to remind her to track her behavior each day. This was eventually suspended when she moved out of her home. Despite the many challenges she faced during the course of treatment, Student C reported no difficulty in completing the daily behavior tracking component of the program.

Outcomes. Table 11 contains values depicting the pre and post-intervention scores for Student B on the BASC-2 SRP (only scores falling in or approaching the clinical range at pre-intervention are included), EAT-26, EDE-Q, and BAI.

Table 11

Pre and Post-Intervention Scores for Student C[d]

Measure	*Scale*	*Pre Score (%ile)*	*Post Score (%ile)*	*Score at 1-month f/up*	*Score at 3-month f/up*
BASC-2 SRP	Internalizing Problems**	63 (90)	52 (63)	50 (55)	
	Attention Problems	66 (91)	66 (91)	61 (85)	66 (91)
	Anxiety**	60 (83)	52 (59)	50 (53)	50 (53)
	Somatization**	69 (94)	51 (62)	51 (62)	54 (71)
	Locus of Control**	64 (89)	55 (71)	55(71)	50 (58)
	Interpersonal Relations	35 (8)	38 (11)	38 (11)	48 (32)
	Relations with Parents	35 (9)	35 (9)	35 (9)	50 (44)

Table 11, cont'd.

Measure	*Scale*	*Pre Score (%ile)*	*Post Score (%ile)*	*Score at 1-month f/up*	*Score at 3-month f/up[d]*
EAT-26	Total Score	3	1	2	3
BAI	Total Score	27	21	20	18
EDE-Q	Restraint	1.6	0	0	0.2
	Weight Concern	1	2	1	0.2
	Shape Concern	1.63	5	3.4	1.5
	Eating Concern	0.6	1	0.8	0.6
	Global Score	1.32	2.50	1.64	0.78
	# Days binge episodes occurred	1	0	0	0
	Purge Episodes	0	0	0	0
	Laxative Use	0	0	0	0
	Compensatory Exercise Days	7	0	0	3

*Indicates a reliable change from pre to post-intervention using the RCI
**Indicates a clinically significant change from pre to post-intervention using the RCI
[d] Parent data was not available at post-intervention or follow-up dates to participant living independently

The data in Table 11 suggests that Student C made clinically significant improvements in several domains following participation in this intervention, including a reduction on the *Internalizing Symptoms Index*, and *anxiety*, *somatization*, and *locus of control* scales. Because

Student C's living situation changed drastically from pre-intervention to post-intervention, it is likely some reported symptom changes may be attributable to this external circumstance. For example, her score on *locus of control* may have decreased because she transitioned from living in an environment with limited freedoms to a more independent living arrangement. On the other hand, Student C showed a marked increase in skill practice over the course of treatment and became a leader in offering suggestions for skill usage during group meetings. It is therefore also likely that Student C's decreases in internalizing symptoms were linked to her mastery of DBT skills, which are designed specifically to reduce affective distress and emotional dysregulation. Figure 5 shows Student C's DBT skill usage and her report of a primary somatic symptom of anxiety, stomach aches.

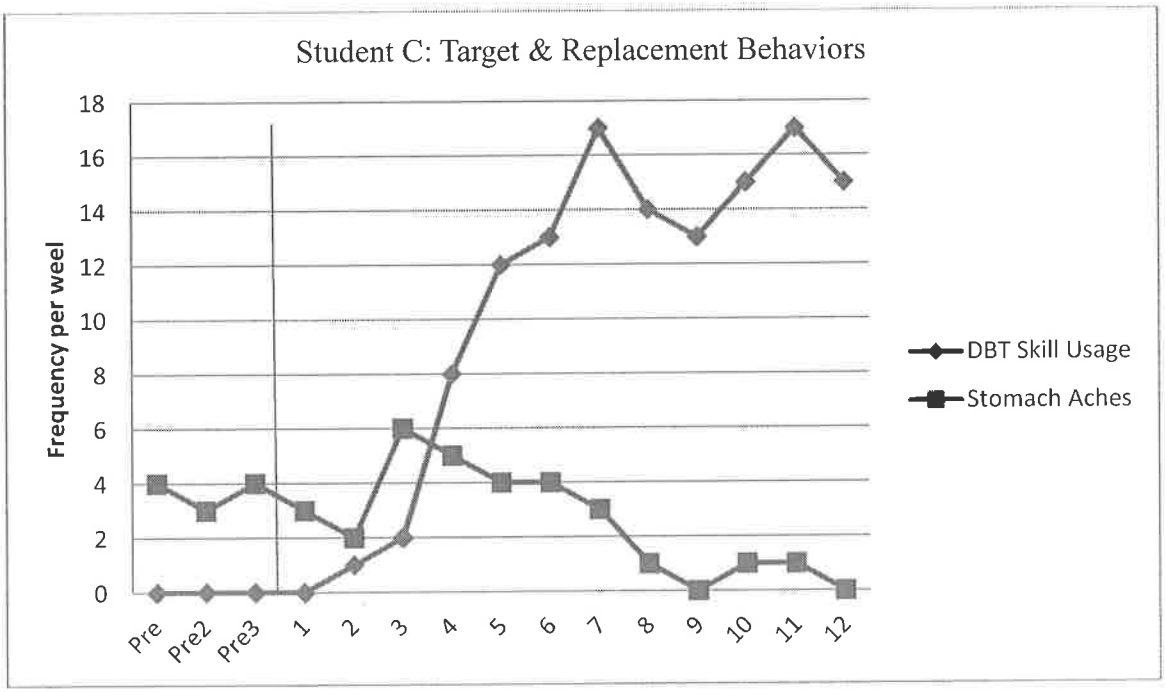

Figure 5. Student C's reported experience of stomach aches (somatic symptom of anxiety) and her engagement in DBT skill usage.

Table 12 below contains values for slope and percentage of overlapping points for Student C's target behavior and DBT skill usage.

Table 12

Slopes and Percentage of Overlapping Points for Student C

Behavior	*Slope*	*% Overlapping Points*
Stomach Aches	-0.33	33%
DBT Skill Usage	1.25	0

As indicated by Table 12, the slope for Student C's stomach aches is negative, suggesting a reduction in symptoms, with 33% overlapping points. Her DBT skill usage increased, showing a slope of 1.25 over 12 weeks, and had zero overlapping data points. Taken together, these data suggest that participation in the DBT intervention was associated with DBT skill usage and a reduction in somatic symptoms of anxiety for Student C.

Acceptability. Student C, her caregivers, and her teacher completed pre and post-intervention social validity surveys. Prior to the start of the program, Student C indicated her expectation that the program would be approved of by her caregivers, would not interfere with her schedule, would teach important skills, would improve her self-confidence, would have lasting positive effects, would improve her ability to focus on school work, and would not interfere with school work. Following participation, Student C reported that the treatment was approved of by her parents, improved her self-confidence, was okay with her teacher, taught important life skills, will have lasting positive effects, and would be something she would do again and recommend to friends. She neither agreed nor disagreed with the following: improved my ability to focus on schoolwork, helped me want to stay in school, and resulted in better grades.

Prior the start of the intervention, Student C's caregiver (aunt) indicated an expectation that Student C's participation in the program would be easy for her to stick with, would teach important skills, would be appropriate given the problem, would be suitable given their family values, would not interfere with school work, and would not result in lower grades. He indicated neutral expectations about whether the program would improve Student C's social skills, have lasting positive effects, improve Student C's self-confidence, and help her focus on school work. Student C's caregivers did not complete acceptability ratings upon completion of the study as she was no longer in contact with them.

Prior to the start of the intervention, Student C's teacher indicated neutral expectations that the program would teach important skills, be suitable for the classroom culture, improve the student's social skills, have lasting positive effects, improve the student's focus on schoolwork., not interfere with her class schedule, would not take additional time for her, and would not interfere with schoolwork or result in lower grades. Following the intervention, Student C's teacher reported that her student's participation in the program interfered with her class schedule, created additional work for both the student and teacher, and resulted in a lower grade. She indicated offered neutral ratings about whether the program improved Student C's social skills, taught important skills, had lasting positive effects, and improved student performance. Her response to the questionnaire item about the intervention being suitable for the classroom culture was "N/A," a response she wrote into the survey.

Generalization and Maintenance. Student C's scores on post-intervention measures and measures scored at one and three-month follow-up suggest that the gains experienced during the course of this intervention were maintained for at least three months following completing of

participation. None of the scores measured at post-treatment were significantly different than those measured at one and three month follow-up, with the exception of *relations with parents*, which increased slightly, but remained within the average range. Overall, these results suggest that Student C maintained her improved functioning even as she encountered significant life transitions, such as moving into a women's shelter and finding work after graduation.

Summary of Single Case Studies

Taken together, these single case studies indicate that clinically significant improvement was experienced following participation in this intervention. Figure 6 below offers a depiction of score changes on the EAT-26 for Students A, B, and C.

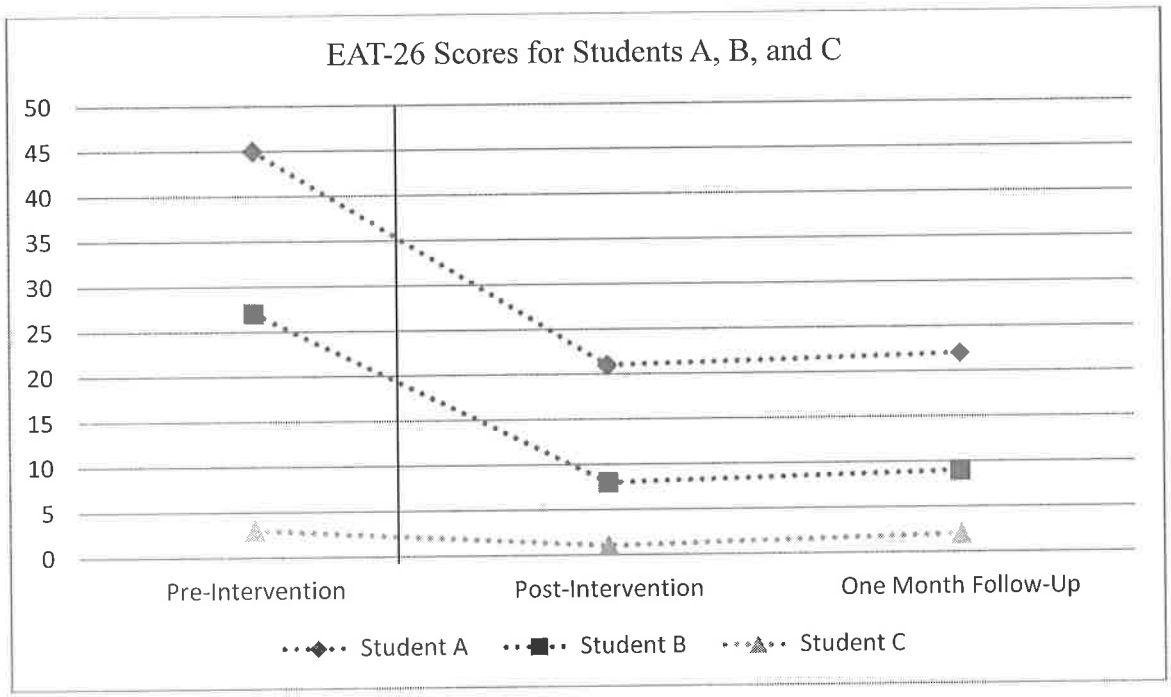

Figure 6. EAT-26 scores for Students A, B, and C at three times: Pre-Intervention, Post-Intervention, and at One Month Follow-Up.

As indicated by Figure 6, for the two students showing symptoms of ED at the outset of treatment, Students A and B, participation in the DBT intervention was associated with

improvement in ED symptoms, as measured by the EAT-26. These improvements maintained after cessation of the intervention, providing strong evidence for the functional relationship between the intervention and improved outcomes. Behavioral data also indicates that this intervention was associated with a reduction in the most severe behavioral symptoms of ED: purging and compensatory exercise. These changes co-occurred with increases in DBT skill usage, suggesting that DBT skills may have offered a more adaptive means of coping with distress than participants had been using. Other ED-related behaviors and cognitions, such as food avoidance and restriction, guilt after eating, and feelings of sadness about body/weight did not improve consistently across participants. However, as small incremental changes in behaviors can be detected more readily than changes in internalizing symptoms, there may have been improvements on these variables that were not detectable using the methods herein. Only one of the two participants with clinically significant symptoms of ED tested in the normal range at post-intervention on measures of ED. This suggests that, while significant behavioral change took place, 12 weeks of school-based DBT skills groups may not be sufficient to reduce disordered eating symptoms in adolescents with more severe ED.

With regard to improvements in general functioning, the aforementioned case studies lend support to the research hypothesis that participation in DBT skills groups would be associated with improved overall functioning. Namely, participants showed clinically significant improvement in certain internalizing symptoms, such anxiety and somatization. These results were consistent across all three participants and co-occurred with reported increases in DBT skill usage. These findings suggest that participation in a similar school-based DBT skills training

group may benefit students with internalizing disorders, even if they do not possess eating-related concerns.

Research Question Two

This study also sought to answer the following question: Will use of mobile technology application for tracking behavioral and cognitive symptoms associated with ED and DBT skill practice be acceptable and rated as helpful by participants?

In this study, an online spreadsheet and a mobile technology application were developed for tracking behavioral data, such as ED symptoms and DBT skill usage. Although behavioral data is not provided for all participants, students from both groups were asked to track their target behaviors and DBT skill usage every day. It was anticipated that the majority of students would be regular computer users and could easily access an online spreadsheet for data tracking or would do so using a mobile device application on their mobile phones. However, only two participants in the experimental condition had smartphones and downloaded the application for data tracking. Two additional students opted to track their data online using home computers; however, one of the two transitioned to paper-and-pencil tracking after she found she did not use her home computer frequently enough to use it for daily data tracking. The remaining participants opted to use the paper-and-pencil tracking forms at the outset of the study due to self-reported infrequent computer usage. All study participants owned cell phones at the outset of the study and agreed to receive text message reminders to track their behavior data (one student had her phone taken away by the parent for a portion of the intervention period).

All study participants reported that daily text message were helpful for reminding them to track data. For the two students who used the mobile phone application to track behavior data,

both reported that it was easy to use and did not require a significant investment of time to maintain. Of the two students who tracked data online, one reported that using that technology was easy and did not require a significant investment of time, and the other reported that using a paper-and-pencil method was easier and took less time. While based on very few reports, these observations suggest that technology used for tracking behavioral data that is available on a mobile device, rather than home computer, may be more convenient for middle and high school students. Students who completed data tracking online or on their phone produced slightly more data than the group that completed paper-and-pencil tracking – an average of 12% more data points. As greater severity of target behaviors resulted in an increased overall number of data points, more information is needed to determine if use of technology resulted in more consistent behavioral tracking. However, as electronic data tracking offers instantaneous recording, while paper-and-pencil methods are likely to suffer from a lag between the time of the behavior and the event recording, it's reasonable to assume that electronic behavior tracking may result in more frequent – and accurate – data recording. This data offers at least preliminary support for that contention. Future studies may wish to provide mobile phones to study participants in order to ensure that everyone has equal access to mobile application technology, which was reported to be an efficient and convenient means of tracking behavior data. An additional benefit of using online or mobile device data tracking methods is that the researcher can observe daily tracking behavior in between group treatment sessions. This can help to validate data, as one can see that it was tracked at regular intervals and not simply completed just before a group session for the entire week. Furthermore, if a researcher becomes aware of symptom increases during the week (e.g., increases in disordered eating behavior), he or she could contact the participant to see if

support is needed; inversely, awareness that a participant is practicing skills or making progress could prompt reinforcement mid-week or at the start of the next group session.

Research Question Three

This study sought to answer the following question: Will implementation of a 12-week DBT skills group in a school setting be rated as helpful and feasible by study participants, parents, and school staff?

Pre and post-intervention acceptability ratings from study participants, parents, and teachers were collected for all high school study participants. Middle school students met after school; therefore their teachers had no knowledge of their participation and their teacher acceptability ratings were not collected. As indicated in Tables 13-19, student participants offered the greatest post-intervention acceptability ratings, with all agreeing that participation in the program was easy to stick with, was approved of by parents, would be something they would recommend to friends, and would be something they would do again. The majority of students agreed that participation did not interfere with their schedules, was approved of by their teachers, improved their self-confidence, and expressed a belief that their participation will result in lasting, positive effects. The majority indicated that participation had no impact on their ability to focus on school, their grades, or their desire to stay in school. Table 13 contains the mean acceptability ratings at pre and post-intervention for all student participants. Note that scores were derived from agreement to key statements on a scale of 1 to 7, with 1 = total disagreement and 7 = total agreement.

Table 13

Pre and Post-Intervention Acceptability Scores from Student Participants (N=7)

Statement. "Participation in this group ..."	*Pre-Intervention Mean (Standard Error)*	*Post-Intervention Mean (Standard Error)*
Will be/was easy for me to stick with	5.86 (0.340)	5.43 (0.719)
Is approved of by my parents	6.14 (0.553)	5.86 (0.670)
Will not/did not interfere with my schedule	5.57 (0.297)	5.14 (0.553)
Did not take additional time*		4.14 (0.911)
Will teach/taught important skills	6.00 (0.309)	5.43 (0.429)
Will be/is okay with my teacher	6.00 (0.535)	5.86 (0.553)
Will improve/improved my self-confidence	4.71 (0.606)	4.86 (0.508)
Will have lasting positive effects	5.00 (0.309)	5.14 (0.340)
Will improve/improved my ability to focus on school work	4.14 (0.459)	3.57 (0.571)
Will not/did not interfere with school work	5.86 (0.553)	5.00 (0.617)
Helped me want to stay in school*		3.43 (0.528)
Resulted in better grades*		4.14 (0.404)
I would recommend to friends*		*5.86 (0.404)* *Post-Intervention*

	Pre-Intervention Mean (Standard Error)	*Mean (Standard Error)*
I would do again if I had to*		6.29 (0.184)

*Items were not included in the pre-intervention survey

Although mean acceptability ratings shifted from pre to post-intervention, paired samples t-tests revealed no statistically significant differences for acceptability questions rated before and after the intervention. Due to the small sample size and relatively large variability between the experiences and expectations of participants in the two groups, statistical comparisons may obscure important data contained in participant acceptability questionnaires. An additional summary of social validity measures, which offers a more qualitative summary of participant ratings for this intervention is provided in Table 14, below.

Table 14

Pre and Post-Intervention Acceptability Ratings from Student Participants (N=7)

Statement. "Participation in this group..."	*Agree*		*Neutral*		*Disagree*	
	Pre	*Post*	*Pre*	*Post*	*Pre*	*Post*
Will be/was easy for me to stick with	57%	100%	43%			
Will be/was approved of by my parents	72%	100%	28%			
Will not/did not interfere with my schedule	85%	85%	15%	15%		
Will teach/taught important skills	72%	85%	28%	14%		
Did not take additional time*						

Table 14, cont'd.						
Statement. "Participation in this group..."	*Agree*	*Neutral*	*Disagree*	*Statement. "Participation in this group..."*	*Agree*	*Neutral*
	Pre	*Post*	*Pre*		*Pre*	*Post*
Will be/was okay with my teacher	85%	57%	15%	43%		14%
Will improve/improved my self-confidence	29%	57%	57%	29%	14%	14%
Will have lasting positive effects	28%	57%	72%	43%		
Will improve/improved my ability to focus on school work	57%	14%	43%	71%		14%
Helped me want to stay in school*				100%		
Resulted in better grades*		14%		71%		14%
I would recommend to friends*		100%				
I would do again if I had to*		100%				

*Items were not included in the pre-intervention survey

Parents completed similar pre and post-intervention acceptability questionnaires; mean acceptability ratings for 6 of the 7 parents of participants are contained in Table 15.

Table 15

Pre and Post-Intervention Acceptability Scores from Parent Participants (N=6)

Statement. "Participation in this group ..."	*Pre-Intervention Mean (Standard Error)*	*Post-Intervention Mean (Standard Error)*
Was/will be easy for my daughter to stick with	6.17 (0.401)	5.83 (0.543)
Will teach/taught important skills	4.67 (0.843)	5.83 (0.477)
Was/will be appropriate given the problem	4.33 (0.715)	5.33 (0.211)
Suitable given our family values	4.67 (0.760)	5.33 (0.715)
Improve(d) my daughter's social skills	4.17 (0.703)	4.33 (0.211)
Improved my child's self confidence	5.33 (0.494)	5.67 (0.422)
Will have lasting positive effects	4.67 (0.882)	5.17 (0.401)
Did not interfere with my school work	5.50 (0.563)	5.67 (0.422)
Did not result in lower grades	5.33 (0.667)	5.33 (0.919)
Will help her focus on school work	4.83 (0.833)	4.67 (0.843)

Paired sample t-tests revealed no statistically significant changes in parent acceptability ratings from pre to post-intervention. However, due to the small number of parent respondents, statistical comparisons may obscure important data contained in participant acceptability questionnaires. A qualitative summary of parent pre and post social validity data is provided in

Table 16, below. Parents offered mixed post-intervention acceptability reviews, with all agreeing that participation did not interfere with school work or result in lower grades and most indicating that the program was easy for their daughters to stick with. The majority of parents were neutral on statements about the program teaching important skills, improving social skills, and being appropriate given the problem. All parents were neutral about the program increasing student self-confidence.

Table 16

Pre and Post-Intervention Acceptability Ratings from Parent Participants (N = 6)

Statement. "Participation in this group..."	*Agree*		*Neutral*		*Disagree*	
	Pre	*Post*	*Pre*	*Post*	*Pre*	*Post*
Will be/was easy for my daughter to stick with	67%	83%	33%	17%		
Will teach/taught important skills	33%	17%	50%	83%	17%	
Will be/was appropriate given the problem	33%	17%	50%	83%	17%	
Will be/was suitable given our family values	33%	50%	50%	50%	17%	
Will improve/improved my daughter's social skills	17%	17%	67%	83%	17%	

Table 16, cont'd.						
Statement. "Participation in this group..."	*Agree*	*Neutral*	*Disagree*	*Statement. "Participation in this group..."*	*Agree*	*Neutral*
	Pre	*Post*	*Pre*		*Pre*	*Post*
Will improve/improved my child's self confidence	50%		50%	100%		
Will have lasting positive effects	50%	17%	33%	83%	17%	
Will not/did not interfere with her school work	50%	100%	50%			
Will not/did not result in lower grades	50%	100%	50%			

Finally, teachers from the high school whose students left class in order to attend group ($n = 3$) also completed such post-intervention acceptability surveys. Table 17 contains averaged acceptability ratings from teachers at pre and post-intervention.

Table 17

Pre and Post-Intervention Acceptability Scores from Teacher Participants (N=3)

Statement. "Participation in this group..."	*Pre-Intervention Mean (Standard Error)*	*Post-Intervention Mean (Standard Error)*
Will not/did not interfere with my class schedule	2.67 (1.202)	1.33 (0.333)
Will not/did not take additional time for me	2.67 (1.202)	1.67 (0.333)
Will teach/taught important skills	5.33 (0.882)	4.67 (1.202)
Will be/was suitable for the classroom culture	4.67 (0.333)	4.67 (0.333)
Will improve/improved the student's social skills	5.00 (0.577)	5.00 (1.000)
Will have lasting positive effects	5.00 (1.000)	5.33 (0.333)
Will improve/improved student's performance	4.67 (0.333)	4.67 (0.333)
Will not/did not interfere with her academics	3.00 (1.000)	3.00 (1.000)
Will not/did not result in lower grades	2.33 (1.333)	4.67 (0.333)

A paired samples t-test was used to determine if significant changes in acceptability were found between pre and post-intervention, and none of the contrasts were significant. Teachers overwhelmingly agreed that participation in the program interfered with their class schedule and created more work for them and interfered with the student's academics. One teacher indicated that a belief that the program taught important skills, improved the student's social skills, and will have lasting positive effects. The other two teachers have neutral ratings to those

statements. All teachers were neutral regarding the program being suitable for the classroom culture. Their responses are listed Table 18, below.

Table 18

Pre and Post-Intervention Acceptability Ratings from Teachers of Teacher Participants (N=3)

Statement. "Participation in this group..."	*Agree*		*Neutral*		*Disagree*	
	Pre	*Post*	*Pre*	*Post*	*Pre*	*Post*
Will not/did not interfere with my class schedule			33%		67%	100%
Will not/did not take additional time for me			33%		67%	100%
Will teach/taught important skills	33%	33%	67%	67%		
Will be/was suitable for the classroom culture			100%	100%		
Will improve/improved the student's social skills		33%	100%	67%		
Will have lasting positive effects		33%	100%	67%		
Will improve/improved student's performance			100%	100%		
Will not/did not interfere with her academics			33%		67%	100%

Table 18, cont'd.						
Statement. "Participation in this group..."	*Agree*	*Neutral*	*Disagree*	*Statement. "Participation in this group..."*	*Agree*	*Neutral*
	Pre	*Post*	*Pre*		*Pre*	*Post*
Will not/did not result in lower grades			33%	100%	67%	

As indicated in Table 18, teachers generally expressed neutral or negative expectations of the program, and evaluations of the benefits of the DBT intervention were only slightly improved following completion of the groups. Notable improvements in ratings from pre-intervention to post-intervention occurred in the areas of teaching important skills, improving student social skills, and having lasting positive effects. Notwithstanding these improvements, positive post-intervention ratings were provided by only one teacher, with two others reporting all neutral or negative evaluations.

Clearly the benefits of participation to students in this program came at a cost to teachers. Students missed one 90 minute block periods per week, which teachers felt resulted in disruptions to their classroom, to the student's academics, and created additional work for them. This feedback is important for evaluating the feasibility of a program of this type being implemented in the future. It is likely that the after-school format of the middle school group would be deemed more acceptable to teachers, as it would minimize disruptions to their schedules. Notwithstanding, some qualitative observations about the benefits of having students attending group during the school day (rather than after school) are noteworthy. For example,

the high school students understood that participation in their group counted as credit toward completion of the class they left in order to attend. Therefore, they had nearly perfect attendance and almost without exception came prepared with behavioral data tracking completed. In fact, all students reported on multiple occasions that they were grateful to be attending group instead of class. In contrast, the students in the middle school group showed highly sporadic attendance and, on several occasions, made it clear they would have preferred to be outside in the fields or on the playground with their friends, instead of being seated indoors participating in group. Similarly, there was little incentive for students in the middle school group to complete data tracking and many times the first part of group had to be used to complete retrospective data tracking. These reports were virtually unusable in this research because of the lack of reliability of retrospective reporting and the apparent lack of investment in the group among the middle school students.

These observations led the researcher to question how pre-intervention social validity ratings may have varied across the two participant groups and if pre-intervention acceptability was associated with treatment adherence in this study. To address this question, pre and post-intervention scores for each participant were aggregated into average acceptability scores, and a comparison of pre-intervention scores for groups was undertaken. Averaged pre-intervention scores were found to be significantly different between high school and middle school participants using an independent samples t-test ($t = 2.874$, $p < 0.035$) with equal variances assumed. With equal variances not assumed, the difference in average pre-intervention acceptability ratings was approaching significance ($t = 2.706$, $p < 0.064$). An item-level comparison was also undertaken and uncovered that significant differences in pre-intervention

social validity scores among participants in the high school and middle school resulted from different responding to three key survey items. Independent samples t-tests revealed that participants in the high school group responded significantly more affirmatively on the pre-intervention social validity questionnaire for two survey items: "Participation [in this group] will teach important skills," ($t = 2.646$, $p < 0.046$ (equal variances assumed), $p < 0.051$ (equal variances not assumed)) and, "Participation [in this group] will have lasting positive effects," ($t = 2.646$, $p < 0.046$ (equal variances assumed), $p < 0.051$ (equal variances not assumed)). One additional item was significant with equal variances assumed and approaching significance with equal variances not assumed: "Participation [in this group] will improve my ability to focus on schoolwork," ($t = 3.464$, $p < 0.09$ (equal variances assumed), $p < 0.074$ (equal variances not assumed)). These t-tests were run to consider both equal and non-equal variances in consideration of the fact that half of the students in the high school group were assessed to be more similar to a clinical population than non-clinical population at pre-intervention, while the middle school group was comprised of individuals with sub-clinical levels of ED symptoms.

A comparison of post-intervention acceptability ratings was also conducted, and a correlation of pre and post-intervention ratings was calculated to determine if students with lower expectations also rated the benefits of participation in the program more negatively, and if these differences were significant across groups. Calculations using independent samples t-tests revealed that post-intervention social validity ratings were significantly different between groups, with equal variances assumed ($t = 2.830$, $p < 0.037$). Without equal variances assumed, the t-test was not significant ($t = 2.480$, $p < 0.109$). Additionally, pre and post-intervention average scores for each participant were correlated to determine if expectations and evaluations

of the program were associated. A Pearson's correlation coefficient of 0.531 was found, which is suggestive of a strong, positive relationship. These findings indicate that participant expectations varied by group at the outset and upon completion of the study; furthermore, expectations of the benefits of the intervention were positively correlated with perceived benefits of participation.

The significant difference in the expectations of benefits of participation in this intervention is likely to have influenced student willingness to participate fully in this program, which included substantial time and effort, including daily homework. Although other variables could have influenced the observed difference in treatment adherence (e.g., the relative severity of concerns among the two groups, the fact that high school participants received course credit for their participation, etc.), the presence of significantly lower expectations on some of the most personally relevant social validity variables (the intervention having lasting positive effects and teaching important skills) suggests that social validity likely influenced the investment of participants in this program. Furthermore, participant expectations were strongly positively correlated with perceptions of participation benefits, suggesting that efforts to increase participant "buy in" at the outset of a study may result in greater investment and, in turn, greater perceived benefits of participation. These finding support previous research that social validity is integral to treatment adherence and should be considered an essential part of intervention planning and data collection.

CHAPTER 5

DISCUSSION AND FUTURE RESEARCH DIRECTIONS

To date, only 4 studies using DBT as a treatment intervention for adolescent ED have been published; only 1 was a controlled study. This is the first study to explore the use of this type of treatment in a school setting using only skills training groups. It stands apart from previous research in its collection of social validity data from students, parents, and teachers; its emphasis upon treatment integrity; its measures for generalization and maintenance data; and its inclusion of data collection regarding technology usage among participants. The generalizability of outcomes reported here are restricted by the limitations outlined below; however, as the quantity and quality of studies using DBT for adolescent ED are modest, the contribution of this study is significant.

Participation in school-based DBT groups was associated with improvements in some ED-related behaviors among participants showing clinically significant symptoms at the start of the intervention. Namely, participants showed a reduction in eating restraint and a reduction in compensatory behaviors aimed at reducing body weight, including episodes of purging and compulsive exercising for at least three months following participation in the group. ED-related cognitions showed a less consistent pattern of improvement, with some symptoms (guilt after eating) improving and others (feeling sad about weight/body) staying relatively stable across the duration of the intervention.

It's noteworthy that ED-related behaviors, but not cognitions, showed consistent improvement over the course of treatment; if we can confidently link these changes to this intervention, these results may lend support to an emotion regulation theory of eating pathology.

DBT for the treatment of eating disorders is based on the affect-regulation model, which conceptualizes disordered eating as a behavioral attempt to influence or control painful emotional states. DBT aims to minimize maladaptive coping mechanisms (e.g. disordered eating patterns) by helping patients more effectively regulate their emotions through replacing self-injurious behaviors with constructive ones. In this study, increases in usage of DBT skills were associated with reductions in ED behaviors, suggesting that participants may have learned more adaptive means of handling difficult emotions over the course of treatment. For example, a participant who might have purged following a meal because she experienced shame about her body or anxiety about gaining weight could turn to a DBT skill (e.g., self-soothing skills) to manage the emotion without having to purge to achieve affective relief.

These findings are consistent with previous studies of DBT for adolescent ED that supported the use of DBT for this population and problem area. This study built upon those findings by modifying DBT to include only skills groups, without individual therapy or parental participation. The duration of this intervention was also shortened from the traditional 16-week duration of adolescent DBT in order to fit into a traditional academic semester. One participant saw a clinically significant reduction in ED symptoms, suggesting that this modified DBT format may be sufficient to address moderately severe ED. On the other hand, the participant with the most elevated ED scores at the start of treatment showed a reliable reduction of symptoms but remained elevated above the clinically significant threshold at post-intervention. These outcomes suggest that more severe ED symptoms may warrant a longer duration of treatment or the inclusion of more comprehensive DBT components, such as individual therapy or participation of parents in skills training, or both.

Participants in this intervention did not report consistent reductions in ED-related cognitions, but may have found adaptive means for handling such painful thoughts and feelings. For example, consistent improvement in parent/guardian reports of behavior support the conclusion that participants learned strategies for handling difficult or unhelpful thoughts or emotions more effectively. A review of previous studies of DBT for adolescent ED offer little data to inform conclusions on the way DBT skills may impact ED-related cognitions. Other approaches commonly used with participants suffering from BN and EDNOS, such as cognitive behavior therapy, focus specifically on both behavior and cognitions and may therefore provide a more comprehensive approach for addressing global symptoms of ED.

Participation in DBT skills groups was associated with improvements in both emotional and behavioral functioning. Specifically, cognitive symptoms of anxiety were reduced for participants showing clinically significant symptoms at the start of treatment. Caregiver reports of behavioral symptoms also showed improvement following participation in the school-based DBT intervention for those students who showed elevated scores at pre-intervention. Notably, these observed improvements co-occurred with increased DBT skill usage. These results suggest that DBT skills may have offered participants practice with adaptive, skillful coping techniques, such as handling sadness or worry by engaging in an activity, rather than sitting at home alone and ruminating (DBT Skill: Opposite Action) or approaching a difficult conversation with a clear, calm, and gentle manner (DBT Skills: DEAR MAN and GIVE). These findings also build upon growing evidence that mindfulness training in schools can reduce symptoms of worry and improve interpersonal relationships among students (e.g., Mendelson, et al., 2010).

This study also sought to evaluate if use of online and mobile technology would facilitate behavioral data tracking among participants. Surprisingly, the use of online and mobile technology was not overwhelmingly adopted by participants, and several preferred to use paper-and-pencil forms instead of tracking their data online or on a smartphone. However, consistent with previous studies (e.g., Rizvi, Dimeff, Skutch, Carroll, & Linehan, 2011), feedback from those who were able to use the mobile technology (the smartphone "app") suggests that these devices may make tracking behavioral data convenient and efficient. The quantity of data collected by participants using mobile technology was also greater than that of participants using paper-and-pencil behavior tracking, suggesting that mobile technology may provide more immediate and convenient means of collecting daily data, resulting in more accurate and abundant information. As data tracking is an essential component of DBT interventions, this type of mobile technology warrants further development and investigation. Indeed, between the dates of proposal for this study and completion of this write-up, at least two DBT apps similar to that developed for use this study had been published. These technologies are sure to be featured in upcoming research and may provide additional evidence that use of mobile technology enhances self-monitoring behaviors, such as tracking DBT skill usage.

Even interventions with the very best empirical evidence may not be feasible for a given setting or population. This study sought to evaluate the feasibility of a school-based DBT skills training program for students with ED and sub-diagnostic eating and body image concerns. While care was taken to collect this data, the feasibility of a school-based group DBT intervention for adolescents remains an open question. Holding the groups at school reduced financial and geographic barriers to treatment and facilitated attendance; however, the format of

this intervention was not universally accepted and perceptions of the benefits of intervention were not consistent across reporters. Outcomes and acceptability reports from participants and parents suggested that students attending group during the school day benefitted from participation, but teachers reported that students missing class was disruptive. Students in the middle school group did not experience such disruptions, but the intervention was more difficult to implement with fidelity due to sporadic attendance and poor treatment adherence. Clearly, buy in from educators is critical for laying the foundation for successful school-based skills training interventions such as the kind undertaken in this study.

Data provided by participants of this study indicated that participant expectations of the benefits of the program were associated with treatment adherence and post-intervention acceptability ratings. Specifically, middle school participants rated their expectations of participation in this program significantly lower than high school students, and these lower acceptability ratings continued at post-intervention. Teachers also expressed neutral and negative expectations for the program, and their ratings improved only slightly following the completion of the intervention. These findings suggest that consideration of appropriate incentives, participant selection, and building rationale for participation in such an intervention (among teachers, parents, and students) are import factors to consider in future studies of this kind. Additional research will be required to determine what timing/setting would balance the needs of teachers (who rightly expect their students in class) and students (who may be less likely to attend if participation competes with a preferred, non-academic activity).

Limitations

Although the results of this pilot study lend support to the hypothesis that participation in a school-based DBT skills training program may benefit students with a variety of symptoms, several notable limitations to this study must be noted. First, the sample size was very small (n = 9), which reduces the power and generalizability of findings. Second, due to a recruitment process that allowed school personnel to encourage participation using their own methods, participants were not homogenous in their symptoms of ED; in fact, most did not show clinically significant ED symptoms at the start of the program. While group heterogeneity is often the rule, rather than the exception, in schools, the group composition of this study limits the generalizability of findings to others with ED. Third, this study did not employ random assignment to groups and groups were non-equivalent on a number of variables, including specific intervention features (e.g., age, group held after school versus during the school day). Fourth, this study relied upon self and caregiver reports and did not include blind raters/observer ratings of symptom improvement from other sources.

Future Directions

This exploratory study represents a small first step toward investigating the efficacy of school-based DBT for adolescent ED and sub-diagnostic eating and body image concerns. Results support the budding body of research findings suggesting that DBT is a useful treatment modality for adolescent ED and those indicating that an educational setting may be well-suited for DBT skills training. Results from this study also contribute to the growing body of literature surrounding mobile technology and its role in behavioral change interventions. Future studies should endeavor to use larger, more diverse samples and test the intervention using only one

format across groups. Study participants should be provided ample information and rationale for participation to ensure that pre-intervention acceptability is adequate and that the anticipated benefits of participation are clearly understood. Future studies may also wish to use more strict inclusion criteria in order to target only those with ED or body image concerns. Studies of technology usage for tracking DBT skills may wish to provide mobile devices to all study participants, or to randomly assign mobile versus paper-and-pencil methods to participants in order to meaningfully compare outcomes related to technology. Finally, future attempts to advance DBT skills training in schools should work with teachers and school staff in the development of academic schedules in order to allow for participation during the day without disruptions to class or teachers. Other formats, such an after school for-credit DBT program, or a rotating schedule so that classes are only missed once or twice per semester, should also be evaluated to determine how best to offer the benefits of school-based mental health services to students while minimizing disruptions to schools and teachers. In another high school setting, it is possible that students could attend group during a study hall period that they shared. It is also possible that an after-school format with high school students might be more successful than with middle school students due to increased maturity and investment in positive outcomes. Despite the limitations outlined above, results from this pilot indicate that more research of school-based DBT group interventions for adolescents with ED and sub-clinical ED symptoms is warranted. Such studies will add to the literature on the use of DBT for adolescent ED and related concerns, as well as contribute information about the modifications to DBT that should be undertaken in order to make DBT an efficacious treatment in schools.

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APPENDICES

APPENDIX A

Intervention Overview and Lesson Plans

Session One Goals: learn names, begin to build group cohesion, collect baseline data

Opening	Introductions Set Session Agenda
Working	Orientation to group – review confidentiality How to "present" group to others at school Complete baseline measures: EAT-26, BASC-2, Social Validity measures (send home to parent, leave with teacher) Teach Evernote/behavior tracking
Closing	Plan for next week Questions?

Session Two Goals: Collect additional baseline data, introduce co-facilitator, fine tune behavior tracking system

Opening	Check in Introduce Co-facilitator Questions from last week? Set session agenda
Working	Revise worksheets individually – schedule reminders to track behavior Administer additional pre-intervention measures: EDE-Q, BAI, BDI
Closing	Review/questions Assign homework: behavior tracking

(Two weeks later): Session Three Goals: Discuss cycle of undereating/overeating and link to media image of "beauty ideal"

Opening	Check in Troubleshoot homework/data tracking system Administer EAT-26 Set Session agenda
Working	Discussion of Body Image Preview Mindfulness skills
Closing	Review Assign homework: behavior tracking Plan for next week

Session Four Goals: Introduce DBT mindfulness skills

Opening	Check in re: homework Set session agenda
Working	Teach: -DBT 3 States of Mind -Mindfulness Skills: collect examples of when they have used or could use? -What are dialectics? Acceptance & Change
Closing	What's your takeaway? Mindfulness Closing Activity: Offer non-judgmental description of self Assign homework:

	-Behavior tracking (now includes skill practice) -Practice mindfulness skills

Session Five Goals: Review and practice mindfulness skills, introduce purpose of learning emotion regulation skills

Opening	Mindfulness Activity: Eating strawberries; reflections Scale of 1-10: How did you do with practice of mindfulness skills? Check-in re: text reminders and behavior tracking Set session agenda
Working	Review mindfulness skills and introduction of 3 specific skills to practice 1. mindful eating 2. urge surfing 3. alternate rebellion Introduction to Emotion Regulation Skills & Rationale for skills to help manage emotion – elicit examples from them of difficult emotions this week
Closing	Review: what's your takeaway? Assign homework: -Behavior tracking -Practice mindfulness skills -Emotion Regulation Handout 1 Plan for next week

Session Six Goal: Finish learning Emotion regulation skills

Opening	Mindfulness Activity: Attention to breath

	Scale of 1-10: How did you do with practice of mindfulness skills? Check-in re: text reminders and behavior tracking, adjust as necessary Set session agenda
Working	Opening Discussion about Emotions: Chain of events – share specific incident from homework sheet Emotion chain of events – where could you have intervened in the chain? Teach: Emotion Regulation Skills (Handouts 2&3)
Closing	Review: what's your takeaway? Mindfulness Closing Activity: snap/crackle/pop Homework: -3 long term goals (see DBT Emotion Regulation Handout 7) -1 pleasant activity per day (see Pleasant Activity Schedule) - Behavior tracking & practice mindfulness skills Plan for next week

Session Seven Goals: Review mindfulness & emotion regulation skills, introduce interpersonal effectiveness

Opening	Mindfulness: eating strawberries Introduce updated skill sheets, skill definitions Review homework: how was pleasant activity? Which worked best? 3 long-term goals?
Working	Review emotion regulation skills Questions about skills? Which are working? Which are not? Rational for interpersonal effectiveness skills

Closing	Review: what's your takeaway? Assign homework: -behavior tracking -practice skills Plan for spring break & afterward

Session Eight Goal: Learn interpersonal effectiveness skills

Opening	Mindfulness: mindful listening vs. non-mindful listening Check-in re: homework, spring break – positive experiences?
Working	Teach interpersonal effectiveness skills: DEAR MAN Practice skills Students coach facilitators to practice skills in a dilemma
Closing	Review: which skills could you use this week? Mindfulness Closing: Breathing meditation Assign homework: behavior tracking & practice mindfulness skills Plan for next week

Session Nine Goals: Review skill usage and link to recurring issues

Opening	Mindfulness: Make PB&J Check-in with skill practice & behavior tracking Share event from this week that caused strong emotions
Working	What skills could have been used to shape outcome? Group feedback -Anticipate an emotion/situation coming up this week and offer 2 skills

	you will use
Closing	Mindfulness Closing: Urge surfing Assign homework: -Behavior tracking & practice mindfulness skills -Permission slip for final meeting Plan for next week

Session Ten Goals: Complete interpersonal effectiveness skills (GIVE, FAST), begin distress tolerance skills

Opening	Mindfulness: Ice Cubes Check-in re: skill usage, tracking Which worked? Which didn't?
Working	Teach interpersonal effectiveness skills: GIVE, FAST Begin Distress Tolerance skills: ACCEPTS, Self-Soothe, IMPROVE the moment -Anticipate an emotion/situation coming up this week and offer 2 skills you will use
Closing	Mindfulness Closing: Engage 5 senses Assign homework: -Behavior tracking -Practice mindfulness skills Plan for next week

Session Eleven Goals: Complete distress tolerance skills

Opening	Mindfulness: Eating strawberries Check-in re: skill usage, behavior tracking – you are almost done!! Review skill practice: Which worked? Which didn't?
Working	Finish Distress Tolerance skills: Pros/Cons, Radical Acceptance and other acceptance skills When will you need these this week?
Closing	Mindfulness Closing: Mindful gratitude Assign homework: -Behavior tracking – last week!! -Reflect on what skills you will use without daily text message reminders. Which would you like to practice or learn more about? What is missing? Plan for next week

Session Twelve Goals: Celebrate, review, offer thanks and praise

Opening	Walk to restaurant (2 minutes spent walking mindfully)
Working	Check-in re: skill usage, tracking Share reflections from previous week What have you learned? Offer non-judgmental observation about self/other Facilitators offer specific praise
Closing	Plan for follow-up in one month Thanks for a great experience

APPENDIX B

SOCIAL VALIDITY MEASURES

Student Pre-Intervention Acceptability Rating Survey

Date:

Student Name:

For each item, please circle the number that most closely represents your opinion about your participation in the DBT skills group:

Participation will:	Disagree			Neutral			Agree
1. Be easy for me to stick with	1	2	3	4	5	6	7
2. Be approved of by my parents	1	2	3	4	5	6	7
3. NOT interfere with my schedule	1	2	3	4	5	6	7
4. NOT take additional time	1	2	3	4	5	6	7
5. Teach important skills	1	2	3	4	5	6	7
6. Be okay with my teacher	1	2	3	4	5	6	7
7. Improve my skills	1	2	3	4	5	6	7
8. Have lasting positive effects	1	2	3	4	5	6	7
9. Improve my academic performance	1	2	3	4	5	6	7
10. NOT interfere with my academics	1	2	3	4	5	6	7
11. NOT result in lower grades	1	2	3	4	5	6	7

Other Expectations:

Student Post-Intervention Acceptability Rating Survey

Date:

Student Name:

For each item, please circle the number that most closely represents your opinion about your participation in the DBT skills group:

Participation:	Disagree			Neutral			Agree
1. Was easy for me to stick with	1	2	3	4	5	6	7
2. Was approved of by my parents	1	2	3	4	5	6	7
3. Did NOT interfere with my schedule	1	2	3	4	5	6	7
4. Taught me important skills	1	2	3	4	5	6	7
5. Was okay with my teacher	1	2	3	4	5	6	7
6. Improved my self-confidence	1	2	3	4	5	6	7
7. Will have lasting positive effects	1	2	3	4	5	6	7
8. Improved my ability to focus on school work	1	2	3	4	5	6	7
9. Helped me want to stay in school	1	2	3	4	5	6	7
10. Resulted in better grades	1	2	3	4	5	6	7
11. I would recommend to friends	1	2	3	4	5	6	7
12. I would do again if I had to	1	2	3	4	5	6	7

What else do you think?

Parent Pre-Intervention Acceptability Rating Survey

Date:

Student Name:

Parent/Guardian Name:

For each item, please circle the number that most closely represents your opinion about your daughter's participation in the DBT skills group:

Participation will:	Disagree			Neutral			Agree
1. Be easy for my child to stick with	1	2	3	4	5	6	7
2. Teach important skills	1	2	3	4	5	6	7
3. Be appropriate given the problem	1	2	3	4	5	6	7
4. Be suitable given our family values	1	2	3	4	5	6	7
5. Quickly improve my child's skills	1	2	3	4	5	6	7
6. Have lasting positive effects	1	2	3	4	5	6	7
7. Improve my child's self-confidence	1	2	3	4	5	6	7
8. NOT interfere with her academics	1	2	3	4	5	6	7
9. NOT result in lower grades	1	2	3	4	5	6	7

Other Expectations:

Parent Post-Intervention Acceptability Rating Survey

Date:

Student Name:

Parent/Guardian Name:

For each item, please circle the number that most closely represents your opinion about your daughter's participation in the DBT skills group:

Participation:	Disagree			Neutral			Agree
1. Was easy for my child to stick with	1	2	3	4	5	6	7
2. Taught important skills	1	2	3	4	5	6	7
3. Was appropriate given the problem	1	2	3	4	5	6	7
4. Was suitable given our family values	1	2	3	4	5	6	7
5. Improved my daughter's social skills	1	2	3	4	5	6	7
6. Improved my child's self-confidence	1	2	3	4	5	6	7
7. Will have lasting positive effects	1	2	3	4	5	6	7
8. Did NOT interfere with school work	1	2	3	4	5	6	7
9. Did NOT result in lower grades	1	2	3	4	5	6	7

Comments/Opinions:

Teacher Pre-Intervention Acceptability Rating Survey

Date:

Teacher Name:

For each item, please circle the number that most closely represents your opinion about your student's participation in the DBT skills group:

Participation will:	Disagree			Neutral			Agree
1. NOT interfere with my schedule	1	2	3	4	5	6	7
2. NOT take additional time	1	2	3	4	5	6	7
3. Teach important skills	1	2	3	4	5	6	7
4. Be suitable for the classroom culture	1	2	3	4	5	6	7
5. Quickly improve the student's skills	1	2	3	4	5	6	7
6. Have lasting positive effects	1	2	3	4	5	6	7
7. Improve student's performance	1	2	3	4	5	6	7
8. NOT interfere with her academics	1	2	3	4	5	6	7
9. NOT result in lower grades	1	2	3	4	5	6	7

Other expectations:

Teacher Post-Intervention Acceptability Rating Survey

Date:

Teacher Name:

For each item, please circle the number that most closely represents your opinion about your student's participation in the DBT skills group:

Participation:	Disagree			Neutral			Agree
1. Did NOT interfere with my schedule	1	2	3	4	5	6	7
2. Did NOT take additional time for me	1	2	3	4	5	6	7
3. Taught important skills	1	2	3	4	5	6	7
4. Was suitable for the classroom culture	1	2	3	4	5	6	7
5. Improved the student's social skills	1	2	3	4	5	6	7
6. Will have lasting positive effects	1	2	3	4	5	6	7
7. Improved student performance	1	2	3	4	5	6	7
8. Did NOT interfere with the student's academics	1	2	3	4	5	6	7
9. Did NOT result in lower grades	1	2	3	4	5	6	7

Other comments/opinions: