

TECHNOLOGY-BASED INTERVENTIONS: A META-ANALYSIS

TECHNOLOGY-BASED INTERVENTIONS FOR ANXIETY DISORDERS IN YOUTH: A
META-ANALYSIS

By

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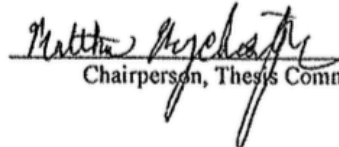
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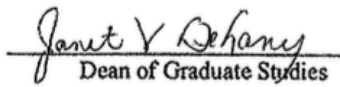
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TECHNOLOGY-BASED INTERVENTIONS: A META-ANALYSIS

Abstract

Anxiety disorders are one of the most common disorders among children and adolescents (Beesdo, Knappe, & Pine, 2009), but often go untreated due to barriers such as time and cost (Salloum, Johnco, Lewin, McBride, & Storch 2016). Technology based Cognitive Behavioral Therapy treatments have been shown to be as effective at treating anxiety disorders as traditional interventions and can help to alleviate some of those barriers (Podina, Mogoase, David, Szentagotai, & Dobrean, 2016; Hedman et al., 2011; Ebert et al., 2015). Although there have been a few meta-analysis studies published regarding this topic, there is a need to explore technology-based interventions further. Past meta-analysis studies have not looked at the relationship between number of sessions and length of sessions to total efficacy, and past research has not looked at parental involvement as a potential moderator. The present meta-analysis sets out to investigate the overall efficacy of technology-based interventions, compare the efficacy of different technology-based interventions, investigate the relationship between number of sessions and length of sessions to total effect size, and look at parental involvement as a potential moderator.

Overall, the results show that technology-based interventions are effective at decreasing anxiety symptoms ($g = 0.71$). Due to uneven group sizes, researchers were unable to compare the efficacy of the different technology groups. Pearson correlations found that there was not a significant interaction between number of sessions and length of sessions to total effect size ($p = .594$ and $.058$ respectively). Finally, results show that parental involvement is a moderator for total effect size, $Z^*_{\text{diff}} = -1.07$, $p = .020$. The results of this study seem to suggest that technology-based interventions are a good option for treatment, but limitations to this study do apply and further investigation into technology-based interventions should still be done.

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Introduction

Anxiety disorders are one of the most common disorders among children and adolescents (Beesdo, Knappe, & Pine, 2009). The Anxiety and Depression Association of America (ADAA; 2016) reported that anxiety disorders affect one in eight children. Costello, Egger, and Angold (2005) found that the prevalence of anxiety disorders in children ranged from 5.7% to 17.7%. The Diagnostic and Statistical Manual of Mental Disorders: Fifth Edition (DSM- 5) provides diagnostic criteria for eight main anxiety disorders: Separation Anxiety Disorder (SAD), Selective Mutism, Specific Phobia, Social Anxiety Disorder (SOC), Panic Disorder-Panic Attack, Agoraphobia, and Generalized Anxiety Disorder (GAD) (American Psychiatric Association, 2013). Beesdo, Knappe, and Pine (2009) reported that SAD had estimates between 2.8% and 8%; GAD between 3% and 5%; Specific Phobia and SOC between 7% and 10%; and Panic Disorder, Agoraphobia, and Selective Mutism were very low in childhood (less than 1%).

Although anxiety disorders are one of the most prevalent in children and adolescents, these disorders often go untreated. Individuals with internalized impairments, such as anxiety, are less likely to receive treatment than individuals with externalized impairments, such as ADHD (Chavira, Stein, Bailey, & Stein, 2004). A study performed by Chavira, Stein, Bailey, and Stein (2004) found that among children with an anxiety disorder, only 31% had received either counseling or medication as a treatment. Children and adolescents with anxiety disorders who do not receive treatment run the risk of having long lasting negative effects. Children experiencing untreated symptoms of anxiety experience impairment of functioning in the domains of health outcomes, financial outcomes, and interpersonal functioning (Copeland, Angold, Shanahan, & Costello, 2014). Children with anxiety disorders also run the risk of developing a new psychiatric disorder such as another anxiety disorder, a depressive disorder,

attention deficit hyperactivity disorder, and many others (Last, Perrin, Hersen, & Kazdin, 1996). Childhood SAD has been found to be predictive of adulthood Panic Disorder (Klein, 1995) due to shared genetic factors between the two disorders (Roberson-Nay et al., 2012). Children with symptoms of GAD experience a significant increase in number and intensity of symptoms throughout adolescence into adulthood (Copeland et al., 2014). Anxiety disorders in childhood and adolescence have been shown to continue into adulthood if not treated early (Labellarte et al., 1999). Studies have shown that 80% of adults with anxiety disorders reported first developing symptoms in childhood and/or adolescence, but had not received treatment for those symptoms at the time (Labellarte et al., 1999).

Treating children and adolescents with anxiety disorders at a young age offers a lot of benefits for the client. Benjamin et al. (2013) found that youth who had successfully completed treatment and no longer had the anxiety diagnosis post treatment, had significantly lower rates of anxiety disorders, depressive disorders, and substance abuse disorders in adulthood. Kendall and Southam-Gerow (1996) completed a long-term follow up study for children with anxiety disorders. Researchers surveyed adolescents who had completed treatment at least 2 years prior. It was found that treatment gains that were present at the 1 year follow up post treatment were maintained at the long-term follow up. A long term follow up study done by Barrett, Duffy, Dadds, and Rapee (2001) found similar results in that 6.5 years after the treatment, 85.7% of participants still no longer met the diagnostic criteria for an anxiety disorder. Treating children and adolescents in childhood has long-term results that can continue into adulthood.

The accessibility of treatment is very important when it comes to treating children. Between school, extracurricular activities, and other obligations, children and adolescents are often time constrained. Having a treatment option that can be easily worked around a child's

busy schedule can increase the number of children and adolescents that are in treatment.

Recognizing that families are struggling to get their children to therapy, researchers in the field have begun to think of treatments that are easily transportable. Interventions that are rising in popularity for children and adolescents who struggle to receive typical treatments include: computer-based cognitive behavioral therapy (CBT), camp-based CBT, school-based CBT, and primary care-based CBT (Elkins, McHugh, Santucci, & Barlow, 2011). A child with anxiety can receive treatment much easier when the interventions are added into things he or she already commonly engages in such as technology use, primary care visits, and school.

Research in this particular area is still new and developing. The purpose of the present study is to evaluate the effectiveness of technology-based interventions for children and adolescents. The present study will first present and discuss research on traditional interventions, barriers to treatment, and technology-based interventions on treating anxiety disorders. It will then discuss a meta-analysis study that looked at the overall effectiveness of technology-based interventions, perform a preliminary exploration of the effectiveness of different types of technology interventions, and look at the effect of technology-based interventions based on number of modules and module length.

Traditional Interventions

There are many different treatments that can be used to help children with anxiety disorders. One of the most effective treatments for anxiety disorders in youth is CBT; CBT is used to teach the child the cause of his or her anxiety and provide strategies to decrease the anxiety (Seligman & Ollendick, 2011). Labellarte and colleagues (1999) report four main strategies of CBT that can be used to address anxiety: exposure, contingency management, cognitive strategies, and modeling. Exposure is based on classical conditioning principles and

involves exposing the client to the situation that causes anxiety. The goal of this strategy is for the situation to lose its ability to cause anxiety in the individual after repeated exposures (Labellarte et al., 1999). Contingency management is based on operant conditioning principles and focuses mainly on reinforcing and shaping new positive non-anxiety behaviors while using punishment and extinction on old negative anxiety behaviors. Cognitive strategies are based primarily on cognitive-learning theory. This strategy focuses on modification of internal factors that influence anxiety such as self-talk and problem solving. Finally, model is based primarily on social learning theories and focuses on demonstrating to the client positive behaviors in anxiety-causing situations.

CBT has been shown to be effective at treating children with anxiety disorders. Seligman and Ollendick (2011) reported that around 66% of children that undergo CBT will no longer meet criteria for an anxiety disorder after 12-16 weeks of treatment. A meta-analysis looking at the effectiveness of CBT treatments on social anxiety disorder in children found a large effect size ($g = 0.99$) suggesting that CBT principles significantly reduce anxiety symptoms in participants (Scaini, Belotti, Ogliari, & Battaglia, 2016). In this particular study, the researchers looked at CBT interventions in both school contexts and clinic contexts. They found that there were moderate to high effect sizes for both school CBT interventions and clinic CBT interventions, which suggests that CBT can be effective at decreasing anxiety symptoms even when not delivered through a clinic-based setting. (Scaini et al., 2016). A systematic review of CBT follow-up studies for children and adolescents with anxiety disorders found similar results (Davis, Mansur de Souza, Rigatti, & Heldt, 2014). Davis and colleagues (2014) looked at 10 studies at their follow up (between 1 and 7 years post conclusion of study) to examine the outcome. It was found that in nine out of the ten studies, 70% or more of the participants in each

study no longer met the criteria for an anxiety disorder at the conclusion of the research study. This result remained the same when looking at the follow-ups. These studies showed that CBT is effective at decreasing and even eliminating anxiety disorder symptoms in children and adolescents.

Although CBT has been shown to be effective in children and adolescents, there is some skepticism around how young individuals can be for this treatment to be effective. Flannery-Schroeder and Kendall (2000) looked at the effectiveness of both group and individual CBT for youth (aged 8-14) with anxiety disorders. Overall, they found that children in both the individual CBT (ICBT) and group CBT (GCBT) groups had significantly less anxiety at the end of 9 weeks compared to children in the waitlist (WL) condition. In addition to that finding, Flannery-Schroeder and Kendall found that 64% of the youth in the ICBT group and 50% of those in the GCBT group no longer met criteria for an anxiety disorder after treatment, however all the kids in the WL condition still met criteria. In a one-year follow-up study, Flannery-Schroeder, Choudhury, and Kendall (2005) found that participants maintained their reduction in anxiety at the follow-up. ICBT had a slightly higher percentage of participants that were without their diagnosis, however, there was not a significant difference between the ICBT and GCBT groups (Flannery-Schroeder, Choudhury, & Kendall, 2005). These studies demonstrated that CBT therapy is effective at decreasing anxiety, and in some cases, eliminating anxiety in pre-teen/early teenaged children. Minde, Roy, Bezonsky, and Hashemi (2010), on the other hand, looked at the efficacy of CBT in younger anxious children (3-7 years old). Minde et al. (2010) had a sample of 37 children that met the criteria for an anxiety disorder. All of these children participated in individual CBT. The researchers found that the children only needed eight sessions to move from abnormal/severe anxiety symptoms to normal/mild anxiety symptoms.

Based on findings, the researchers suggested CBT can be effective in decreasing anxiety in very young children as well as older children.

Barriers to Treatment

Although anxiety disorders are common and demonstrate an encouraging response to psychotherapeutic intervention, many children go without services. Merikangas and colleagues (2011) reported that two thirds of adolescents with a mental illness go without services needed to treat their disorder. Salloum, Johnco, Lewin, McBride, and Storch (2016) looked at common barriers to treatment for children with anxiety. It was found that the most common barriers to children receiving and completing services were stigma, confidentiality in the sense that the child was worried the professional would tell other people about what they said in session, costs, and not having the time to attend sessions. They found that children who dropped out of treatment were more uncomfortable discussing issues and felt ashamed of going to treatment (Salloum et al., 2016). Parents of children in both treatment and waitlist conditions reported having high concerns regarding the cost of treatment (Salloum et al., 2016). Children and adolescents often have little free time in their schedules which can result in them not having enough time to attend sessions. Youth often go to school full time, have after school activities, sports, and/or have to complete their school homework. When it comes to the youth population, the parents also have to be kept in mind. Many parents may not be able to take time off from work to get their child to treatment or they would have to find a time scheduled around both the child's and the parent's busy schedules. The barriers discovered by the researchers were related to children dropping out of therapy and not getting the help they need. Chandra and Minkovitz (2006) reported that many youth with mental illness are embarrassed, do not want to talk about their mental health issues, and do not trust counselors. If children and adolescents with a disorder, or the parents of those

youth, believe that the symptoms will improve on their own, they were less likely to seek out mental health treatment (Cheng, 2009).

Another potential barrier to youth receiving services is parental expectations of therapy. A study performed by Nock and Kazdin in 2001 looked at parental expectations and the relation to participation in therapy. Nock and Kazdin assessed the parent's expectancies in regards to the outcome of therapy, the therapist, and the intervention. The researchers then looked at the barriers to treatment participation, treatment attendance, and premature termination. They found that parents who had lower expectations for therapy experienced more barriers to treatment participation (such as sharing with the therapist) but it did not affect their treatment attendance or termination. Although it did not affect treatment attendance or termination, the parent's expectations can have a large impact on treatment participation. These kids may be attending therapy regularly, but are not actively or consistently engaged in the treatment process. Parental expectancies can be influenced by many factors. Parents can have negative expectancies due to having their own mental illness or having failed past attempts at therapy (Nock and Kazdin, 2001). Changing these expectations or engaging parents in the therapy process can help to reduce this potential barrier for the child's treatment outcomes.

The barriers discussed above have also been shown to affect individuals' ability to benefit from treatment as well (Kazdin, Holland, Crowley, & Breton, 1997). Kazdin and colleagues found that individuals in therapy that experience these barriers spend fewer weeks in therapy, have higher rates of cancelling appointments, and have higher rates of not showing up to sessions. Participation can also be impacted by barriers such as therapist-parent relationships as well as therapist-client relationships. The parent's and child's alliance/bond with the therapist relies on how much they like the therapist, if they perceive support from the therapist, and if they

feel comfortable disclosing to the therapist. Parents who felt that there was not a good relationship between the family and the therapist were less likely to consistently bring their child and more likely to drop-out from treatment all together (Stevens, Kelleher, Ward-Estes, & Hayes, 2006). Clients who feel there is a low therapist-client relationship are less likely to participate which results in low symptom change (Zandberg, Skriner, & Chu, 2015).

Benjamin, Harrison, Settiani, Brodman, and Kendall (2013) looked at the outcomes of treatment for anxiety in children through comparing successfully and unsuccessfully treated participants. The researchers used individuals who had participated in anxiety studies when they were children. The participants were surveyed about the outcomes of the study and their mental health was evaluated. Successful treatment was defined as participants that did not have the principal anxiety disorder at post treatment of the original study. Unsuccessful treatment was defined as participants that still had the principal anxiety disorder at post treatment of the original study. Unsuccessful treatment of the children's anxiety significantly predicted adulthood panic disorder, alcohol dependence, and drug abuse (odd ratio of 9.34, 9.42, and 7.0 respectively) (Benjamin et al., 2013). Benjamin et al. (2013) did not look at what caused the unsuccessful treatment of the children; however, it is possible that the barriers discussed previously contributed. It would be important for researchers and therapists to find alternatives to these barriers to help children and adolescents receive the mental health services they need.

Technology-Based Interventions

Given that a lack of time and rapport are often noted as barriers, one possible solution to these barriers that has been shown to be effective is technology-based interventions, which can be described as any intervention that makes use of technology (Podina, Mogoase, David, Szentagotai, & Dobrea, 2016). These technologies can include: internet delivered programs,

CD-ROMS, virtual reality, web-cams, and smart phone/tablet devices (Podina et al., 2016).

Technology-based interventions offer many advantages including more control for the client, easy access and portability, increased mastery of coping skills, being less time consuming from first visit to completion, and having less expenses (Podina et al., 2016).

Internet based CBT (inCBT) is one of the main technology-based interventions that can be used to help children with anxiety disorders. inCBT makes use of the internet to deliver CBT techniques to the clients. There are two different forms of inCBT: open access programs and guided programs. Open access programs are completely open to the public and has no guidance from professionals in the field (Andersson, Carlbring, Ljotsson, & Hedman, 2013). While these programs are the most accessible to the public, they have not been shown to have large treatment effects for individuals. Guided programs for inCBT require the identification of a professional counselor/therapist in the field. This form of inCBT is less open to the public, but yields long-term treatment effects. Although an individual would need a diagnostic interview with a professional prior to starting this treatment option, after that initial interview the client would receive guidance from the therapist once a week through email. On average, inCBT has around 10 sessions/modules. The client is free to complete the sessions at their own pace, however there is typically a final deadline for when they should be finished with the modules.

inCBT is a great therapeutic option for combating the barriers discussed previously. inCBT could help to reduce the stigma of therapy because children are completing the modules in the privacy of their own home. A study performed by Tate and Zabinski in 2004 reported that offering psychological treatment over the computer can limit shame and embarrassment that a client may feel as well as possibly reduce social desirability and pressure for a client to respond a certain way when face-to-face with someone. With regards to the child not having time to

complete the CBT homework or attend sessions regularly, inCBT may help because the child is able to do the modules on his/her own time and can spread them out. inCBT can easily be worked around the schedule of the child and the parent, plus many inCBT programs will save the client's progress so the client is able to leave the program and come back at a later time (Tate & Zabinski, 2004). Finally, with regards to the cost of therapy, inCBT has been shown to be less expensive than traditional therapy sessions. For instance, Hedman et al. (2011a) looked at the cost effectiveness of inCBT compared to CBT group therapy (CBGT) within individuals with SOC. The costs were assessed at three different time points: pre-treatment, post-treatment, and six-month follow-up (Hedman et al., 2011a). Hedman and colleagues found that there was a significant difference in the intervention costs per participant: the inCBT group was around \$464 and the CBGT group was around \$2687. inCBT costs significantly less money than traditional CBT therapy for SOC and inCBT was found to be just as effective at decreasing anxiety within the participants as the traditional therapy (Hedman et al., 2011a). inCBT is a good alternative to traditional therapy, especially for individuals who cannot afford the costs of traditional therapy.

Other studies have also shown the effectiveness of inCBT. Due to the challenges faced when performing research with children, Alaoui et al. (2015) looked at the effectiveness of inCBT with SOC in adults in a psychiatric setting. They found that there was a significant reduction in social anxiety symptoms within the participants that sustained over time (Alaoui et al., 2015). Hedman et al. (2011b) also looked at the social anxiety levels in adults after receiving either inCBT or CBGT for 15 weeks. At the end of the 15 weeks and at the six-month follow-up, the participants in the inCBT group had similar lowered anxiety symptoms as the individuals in the CBGT group. Although these studies were performed with adult populations, the results can be generalized to children as well. Studies have shown that children and adolescents with anxiety

meet similar criteria and have similar symptoms as adults with anxiety (Spence, 1997). Children, adolescents, and adults face similar barriers to treatment as well as responses to treatment. How the individual responds to treatment, no matter the age, depends on how the client likes the therapist, the ability to trust the therapist, and the perceived support from the therapist. inCBT may be just as effective at reducing anxiety symptoms in children and adolescents due to these similar factors.

Another technology-based intervention that has shown to be effective is virtual reality CBT (VRCBT). VRCBT puts clients in a virtual environment/situation that changes based on the client's head and body movements (Parsons & Rizzo, 2008). VRCBT allows clients to be exposed to feared and anxiety provoking situations in a systematic manner. VRCBT offers many advantages to traditional interventions for anxiety disorders. Some of these advantages include: more control over specific situations, easier to engage in *in-virtuo* exposures as compared to *in-vivo* exposures for phobias that may be dangerous in person, and can help to reduce issues of confidentiality (specifically in regards to exposures) (Bouchard, 2011). Virtual reality can be accessed through computer monitors or cell phones with goggles which makes it easily accessed for many individuals (Bouchard, 2011). Anderson and colleagues (2013) looked at the effectiveness of VRCBT to decrease fear of public speaking in adults. Participants completed 8 sessions of either VRCBT, traditional exposure therapy, or were placed in the waitlist condition. VRCBT was just as effective as traditional exposure therapy at decreasing anxiety symptoms (M difference = 1.6, $p = .42$) and significantly more effective at decreasing anxiety symptoms than the waitlist condition (M difference = 5.01, $p = .01$) (Anderson et al., 2013). A meta-analysis completed by Opris and colleagues (2012) found similar results. VRCBT was used to treat fear of flying, panic disorder, social phobia, arachnophobia, acrophobia, and PTSD in adults. VRCBT

was shown to be significantly effective at decreasing anxiety symptoms for all of these disorders compared to waitlist conditions ($D = 1.12$; $VAR D = .34$, $p < .05$) (Opris et al., 2012). VRCBT was just as effective at decreasing anxiety symptoms as traditional evidence based interventions and had stability at the 3-6 month follow-up and the 1 year and above follow-up (Opris et al., 2012).

Technology Based Interventions in Youth

Many studies have shown that technology-based interventions are effective at decreasing anxiety symptoms in adults. These findings have also been shown to be true for children. Storch and colleagues (2011) looked at the efficacy of web-camera CBT (W-CBT) for children with Obsessive Compulsive Disorder (OCD). W-CBT provides a real-time delivery of therapy to an individual through the use of a web-camera. This treatment option has reduced costs of services, can be used in multiple settings (such as home, school, and in the community), and it can decrease or eliminate the embarrassment or stigma attached to seeing a therapist (Storch et al., 2011). In past DSM editions, OCD was classified as an anxiety disorder due to having similar symptomology. In this study, 31 participants were split into the W-CBT condition or waitlist and underwent 14 sessions. W-CBT was shown to be effective at decreasing OCD symptoms in the children at post treatment and at the 3-month follow-up ($F = 9.22$, $p = .005$) (Storch et al., 2011). Rooksby, Elouafkaoui, Humphris, Clarkson, and Freeman (2015) performed a meta-analysis on inCBT for childhood anxiety. They included 7 studies in their analysis that all looked at inCBT measures to decreasing anxiety symptoms in children aged 7 to 16. All of the studies reported that the individuals in the inCBT groups improved similarly to individuals in the clinic groups that received traditional CBT (Rooksby et al., 2015). The results also showed that within each study there was a similar number of children who were free of an anxiety diagnosis after the

intervention (Rooksby et al., 2015). The studies also reported that the inCBT groups had high rates of compliance (72% or higher) and high completion rates (5/6 parents and 7/10 children) (Rooksby et al., 2015). The results of this meta-analysis with children supports the same findings as studies performed on adults with anxiety.

Another meta-analysis performed by Ebert and colleagues (2015) reported similar findings. Seven of their total studies focused specifically on anxiety in children and the other studies focused on either depression or a combination of anxiety and depression (Ebert et al., 2015). Many of the studies used either inCBT and CD-ROM CBT as the main treatment. CD-ROM CBT utilizes a CD-ROM that contains a CBT program, such as Camp Cope-A-Lot or Coping Cat. These programs are interactive and allow for the client to advance on their own through 12 sessions. Overall, compared to the control group, they found that inCBT and CD-ROM CBT had significant and moderate to large effects on lowering the symptoms of anxiety and depression in the children ($g = .72, p < .001$). Although the results support findings from many other studies, there were some limitations to this study including not being able to examine the differences between the treatment formats, inCBT versus CD-ROM CBT, due to the low number of available studies (Ebert et al., 2015).

A meta-analysis completed by Podina, Mogoase, David, Szentagotai, and Dobrean (2016) looked at different forms of technology-based CBT interventions: inCBT and VRCBT. These authors used 8 total studies looking at the efficacy of these technology-based interventions with children compared to traditional CBT intervention and waitlist controls. Overall, they found that the children in the technology based groups had significantly less anxiety than the children in the waitlist group at post-intervention, however there was not a significant difference between the technology-based and the traditional CBT groups (Podina et al., 2016). The researchers looked at

therapist involvement as a moderator, which was described as how much time the therapist put in each week to provide feedback to the clients. They found that the degree of therapist involvement moderated the anxiety levels at post-intervention: the technology-based groups had significantly lower levels of anxiety than the waitlist groups when there was low therapist involvement over high therapist involvement, however both groups had a decrease in anxiety levels (Podina et al., 2016). The researchers also looked at age as a moderator. They found that age of the participant was a significant moderator of anxiety: older children experienced less anxiety at post-intervention than younger children when in the technology based groups (Podina et al., 2016). Overall, the results of this meta-analysis support the findings from previous studies that technology-based interventions are effective at decreasing anxiety symptoms in children and adolescents. These interventions can be used as alternatives to or concurrently with traditional CBT to provide treatment for children and adolescents.

The studies looking at technology-based interventions have shown effectiveness at decreasing anxiety symptoms. While these studies have not shown that technology-based interventions are more effective at decreasing anxiety symptoms than the traditional interventions for anxiety, there is clinical utility in these results. Individuals experiencing anxiety symptoms can use traditional interventions or technology-based interventions to decrease their symptoms. Technology-based interventions may be better for individuals experiencing many barriers to completing traditional interventions, such as cost, time, and stigma.

Current Study

The aim of the current study is to contribute to the growing literature on technology-based interventions for anxiety in youth. Current published research is lacking in comparing the technology-based intervention types and showing which intervention type is the most effective at

decreasing anxiety symptoms. The current published research is also lacking in comparing the efficacy of technology-based interventions based on the number of modules and the duration of the intervention modules. Finally, current published research is lacking in looking at parental involvement as a potential moderator in the therapy outcomes. Using meta-analytic procedures, the present study will aim to add to the areas that are lacking by compare the efficacy of technology-based interventions based on the intervention type (inCBT, VRCBT, and CD-ROM CBT), compare the efficacy of technology-based interventions based on the number of sessions and the duration of the intervention modules, and look at parental involvement as a potential moderator on the efficacy of technology interventions.

Method

Hypotheses

There are five hypotheses for this study. The first hypothesis is a replication of previous meta-analytic studies that technology-based interventions will be effective at decreasing anxiety symptoms. The second hypothesis is that there will be a difference in effectiveness between the intervention types, however, we are uncertain which intervention type will be more effective. This hypothesis will be exploratory in nature. The third hypothesis is that the number of sessions will be positively correlated with total effect size (the more sessions, the higher the effect size). The fourth hypothesis is the duration of the intervention modules will be positively correlated with total effect size (the longer the duration of the intervention modules, the higher total effect size). The final hypothesis is that parental involvement will be a moderator for total effect size for a study.

Data Search

Relevant studies were identified and reported using the PRISMA guidelines (Moher et al., 2009). The PRISMA guidelines consist of criteria that systematic reviews and meta-analyses must meet in developing and reporting research. The PRISMA guidelines consist of a statement, a flow chart, a diagram, and an elaboration and an explanation (Moher, et al., 2009). Systematic searches of PsycINFO, EBSCO, and Medline databases were utilized to provide a wide range of research articles. Keywords such as “Social Anxiety Disorder,” “adolescents,” “technology,” “children,” “internet,” “anxiety disorders,” “computer,” “virtual reality,” “child anxiety disorders,” and “childhood” were used to identify potential studies. These keywords were typed into the search engines on their own and in different combinations to get the greatest number of results possible. The titles and abstracts of the potential studies were screened to assess their relevance based on inclusion criteria.

The inclusion criteria that was used to determine relevance are: (a) participants must fit criteria for an anxiety disorder diagnosis, (b) the study must include a sample of children (birth-12 years) or adolescents (13-18years), (c) the study must include a technology-based intervention (inCBT, VRCBT, CD-ROMs CBT, W-CBT, or Phone/Tablet Application CBT), (d) the study must be experimental or quasi-experimental designs, and (e) the study must be written in English. We excluded studies that focused on other disorders and did not primarily address anxiety symptoms. *Figure 1.* shows the process of finding studies and excluding or including studies into this meta-analysis.

Through this process, we identified a total of 647 records. After removing duplicate records, we were left with 632 records to screen using the inclusion criteria discussed above. 601 records were excluded solely based on the titles of the articles (many did not discuss technology

or anxiety). 31 total full-text articles were screened for eligibility. 17 total articles were excluded from inclusions for specific reasons: four studies were meta-analysis or review articles, seven had participants outside of the age range, two studies did not use participants who were diagnosed with anxiety disorders, one study was solely a prevention study, one study was only available in Spanish, and two studies were feasibility/case studies. After those articles were excluded, we were left with 14 total articles that met all of the inclusion criteria and were included in synthesis.

Data Analysis

Once the relevant studies were identified, the studies were coded based on a developed code book. Each study was coded by country, randomized N, mean sample age, control nature (None, Waitlist, Normal Treatment, or Computer Education [not CBT]), intervention type (CD-ROM, Computer/Internet CBT, or Virtual Reality), number of sessions/modules, duration of sessions/modules, follow-up assessments, type of reporter (Child, Parent, or Therapist), outcome measure, parental involvement, and random assignment. The codes were used to look at the moderators for all of the relevant studies.

After all of the relevant studies were coded, we used Hedges g to look at the effect sizes of each study (Hedges and Olkin, 2014). Hedges g is similar to Cohen's d in that an effect size of 0.2 – 0.5 signified a small effect, an effect size of 0.5 – 0.8 signified a medium effect, and an effect size of 0.8 and higher signified a large effect (Cohen, 1988). To test the first hypothesis, pre-post contrast effect sizes (standardized mean gain) will be used. This test will be used to look at the effectiveness of technology-based interventions over time (pre-intervention to post-intervention and pre-intervention to follow-up). Random-effects statistic effect sizes will be reported for the overall effect size due to the studies using different measures and participants.

The random-effects model accounts for any differences between the individual studies and that effect sizes may differ between the studies (Borenstein, Hedges, Higgins, & Rothstein, 2009).

To test the second hypothesis, pre-post contrast effect sizes will be calculated for the control group vs. the technology-based interventions combined. This will allow for a comparison between control group and technology. Random-effects statistic effect sizes will be reported for this hypothesis as well. Follow-up analyses will also be performed to look at the specific technology-based interventions for the second hypothesis. Pre-post contrast effect sizes will be completed for each technology-based intervention individually (pre-inCBT vs. post-inCBT, pre-CDROM CBT vs. post-CDROM CBT, pre-VRCBT vs. post-VRCBT). Due to the uneven number of studies in each group, these effect sizes will not be able to be compared to each other, however, the effect sizes will still be reported as part of a preliminary exploration of the groups.

To test the third and fourth hypotheses, Pearson product-moment correlations will be calculated. It is hypothesized that the number of sessions will be correlated with the total effect size and that the length of the sessions will also be correlated with the total effect size. If there are significant correlations between these variables, a simple linear regression will be performed to see if changes in one variable are predictive of changes in another.

To test the final hypothesis, the pre-post contrast effect sizes calculated for the first hypothesis will be used. These effect sizes will be looked at by being split between parental involvement and no parental involvement. A Z test will be completed to look at the differences in effect size between the two groups.

Results

Study Pool Characteristics

The selected 14 studies were published between 2006 and 2016 with a median publication year of 2011. The studies were conducted in Australia (n = 6), USA (n = 4), Sweden (n = 3), and Spain (n = 1) (as shown in Table 1). Of the 14 studies, 57% (n=8) had some type of parental involvement (Table 2). Eleven of the studies reported that they used random assignment in their study design. The three studies that did not use random assignment were due to all of the participants receiving the intervention. Eleven studies (78%) reported that they had a follow up assessment of anxiety, whereas 3 studies (22%) did not follow up with participants at a later point in time. The mean follow-up for the studies was around 4 months after the completion of the study.

Participant Characteristics

Between the 14 total studies, there were a total of 735 participants. The age of the children and adolescents ranged from 3 years old to 18 years old (mean age range of 4.08 to 16.50), with a mean age of 11.04 years old. All of the participants were diagnosed with anxiety disorders with many of the studies reporting that participants had a range of anxiety disorders. Eleven studies reported having some participants with SAD, 11 studies reported having some participants with SOC, 11 studies reported having some participants with GAD, 10 studies reported having some participants with specific phobia, 4 studies reported having some participants with panic disorder, and 1 study reported having participants with school phobia.

Primary Outcome Measures

There were 16 total primary outcome measures used between the studies that all measured anxiety levels in some way. The 16 outcome measures were the Anxiety Disorders

Interview Schedule for Children (ADIS), the Pediatric Anxiety Rating Scale (PARS), the Childhood Anxiety Impact Scale-Child and Parent versions (CAIS-C and CAIS-P), the Multidimensional Anxiety Scale for Children (MASC), the Spence Children's Anxiety Scale-Child and Parent Versions (SCAS-C and SCAS-P), the Social Phobia Screening Questionnaire-Child (SPSQ-C), The Liebowitz Social Anxiety Scale- Self-Report Fear and Avoidance versions (LSAS-SR-F and LSAS-SR-A), the Beck Anxiety Inventory (BAI), the Revised Children's Manifest Anxiety Scale (RCMAS), the Screen for Child Anxiety Related Disorders-Parent version (SCARED-P), the Fear Survey Schedule for Children- Revised Child and Parent versions (FSSC-R-C and FSSC-R-P), and the Preschool Anxiety Scale (PAS). These 16 outcome measures were used either individually or in some combination to measure the anxiety levels.

Intervention Characteristics

Between the 14 studies, three main intervention types were used: CD-ROM CBT, inCBT, and VRCBT. 7% of the studies (n=1) used VRCBT as their intervention type, 14% of the studies (n=2) used CD-ROM CBT as their intervention type, and 79% of the studies (n=11) used inCBT as their intervention type (Table 3). In regards to the control nature used in the studies, 22% (n=3) used no control group, 50% (n=7) used a waitlist control group, 7% (n=1) used normal treatment as a control group, 14% (n=2) used both waitlist and normal treatment as control groups, and 7% (n=1) used both normal treatment and computer education as control groups (Table 4). When breaking down the effect of the control groups, the studies that used multiple control groups were broken apart to look at the individual control groups separately.

Sessions/Modules

The studies were all coded for number of sessions/modules and duration of the sessions/modules. The minimum number of sessions/modules was 3 (Keller, 2010) and the

maximum number of sessions/modules was 12 (Storch et al., 2015; Khanna & Kendall, 2010; & Crawford et al., 2014) with a mean number of sessions of 9.5 (Table 5). In regards to the duration of sessions/modules, the minimum length of a session was 15 minutes (Cunningham et al., 2009 & Vigerland et al., 2013) and the maximum length of a session was 60 minutes (Spence et al., 2011; March et al., 2009; Spence et al., 2006; & Donovan & March et al., 2014) with a mean length of 41.82 minutes (Table 6).

Intervention Outcomes

Thirteen of the 14 studies reported overall decreases in anxiety from pre-intervention to post-intervention. Table 7 shows the pre-intervention and post-intervention anxiety means for each individual study. All of the studies except one (Cunningham et al.) reported significant decreases in anxiety from pre-intervention to post-intervention. Although the ADIS was reported as a primary outcome measure, for this study the ADIS scores were separated from the overall analysis. The ADIS is a diagnostic tool whereas the other primary outcome measures report anxiety levels in general. Because the ADIS is used for a diagnostic purpose, we separated those scores from the overall analysis and looked at them separately. A score of 4 and higher on the 7-point scale typically suggests a diagnosis of an anxiety disorder. Six out of the nine total studies who used the ADIS reported participants had lost their anxiety diagnosis by the end of treatment due to the significant decrease in symptomology (Crawford et al., 2014; Donovan & March, 2014; Khanna & Kendall, 2010; Spence et al., 2006; Storch et al., 2015; & Vigerland et al., 2013). At pre-intervention, the participants in these studies had scores above 4 on the ADIS measure, whereas at post-intervention, the participants in these studies had scores below 4. The three studies who also used the ADIS, but did not report participants losing their diagnosis, still reported decreases in anxiety levels and symptoms across participants (March et al., 2009;

Vigerland et al., 2016; & Wuthrich et al., 2012). At pre-intervention, the ADIS scores were at 5 and above, and at post-intervention, the ADIS scores were 4.

Sustained Outcomes

Twelve of the 14 studies included follow-up assessments following the conclusion of the intervention. These follow-up assessments took place between one month and 12 months post the conclusion. Table 8 summarizes the follow-up assessment anxiety means for the studies. Overall, all of the studies who used follow-up assessments still reported decreased anxiety means as compared to the pre-intervention assessments. When looking at the post-intervention means compared to the follow-up assessment means, one study reported increases in anxiety means for all of their assessment tools (Tillfors et al., 2011). Two studies, (Vigerland et al. & Wuthrich et al.) reported slight increases in anxiety means for one or two of their overall assessment tools, but decreases in anxiety means for the other assessments.

Data Synthesis

A meta-analysis was conducted to assess the overall effect size of the 14 studies. All of the effect sizes were calculated using the random-effects model and will be reported as such. First, the overall effect size for the technology-based interventions was calculated. A random-effects statistic effect size of 0.71 [95% CI: 0.55, 0.88] was found which was statistically significant ($z = 8.65, p < .001$). Although they are not able to be compared to each other due to the small group sizes, the individual technology-based interventions were still broken apart to look at their individual effect sizes. An effect size of 0.79 [95% CI: 0.63, 0.94] was found for inCBT which was statistically significant ($z = 9.90, p < .001$). An effect size of 0.14 [95% CI: -1.02, 1.31] was found for CDROM CBT which was not statistically significant ($z = 0.24, p = 0.41$). Finally, an effect size of 0.37 [95% CI: 0.00, 0.74] was found for VRCBT which was also

statistically significant ($z = 1.96, p = 0.024$). Although the individual technology-based interventions were broken down to look at them individually, it is important to keep in mind that the number of studies in each of these groups were not even. Because these group sizes were not similar, the results of breaking the interventions apart should only be looked at as an exploratory hypothesis.

Meta-analysis statistics were also performed on the control groups of the study in order to be comparative between the two groups. First, the overall effect size for the control groups was calculated. A random-effects statistic effect size of 0.36 [95% CI: 0.24, 0.48] was found which was significant ($z = 5.93, p < .001$). Next the individual control groups were broken apart to look at the individual group effect sizes. An effect size of 0.32 [95% CI: 0.20, 0.44] was found for the waitlist group which was significant ($z = 5.35, p < .001$). An effect size of 0.50 [95% CI: 0.33, 0.67] was found for the treatment as normal group which was statistically significant ($z = 5.62, p < .001$). Finally, an effect size of 0.57 [95% CI: 0.15, 0.99] was found for computer education which was also statistically significant ($z = 2.68, p = .004$).

Meta-analysis statistics were completed looking at the follow-up scores for studies to see if the effect continues after treatment. First, a random-effects statistic effect size of 1.01 [95% CI: 0.76, 1.25] was found for pre-intervention to follow-up which was statistically significant ($z = 8.06, p < .001$). This shows that technology-based interventions have a large effect on anxiety levels 3-12 months post treatment. Next, we looked at the effect size between the mean anxiety scores immediately post treatment and the mean anxiety scores at the follow-up time points. An effect size of 0.44 [95% CI: 0.23, 0.65] was found which was statistically significant ($z = 4.12, p < .001$).

When coding the articles, researchers noticed that some studies (57%) had parents also completing some modules with the children, whereas other studies (43%) only had the children completing the modules. A random-effects statistic effect size of 0.79 [95% CI: 0.59, 0.98] was found for the studies using parental involvement which was statistically significant ($z = 7.89, p < .001$). A random-effects statistic effect size of 0.59 [95% CI: 0.29, 0.89] was found for the studies without parental involvement, which was also significant ($z = 3.88, p < .001$). A Z-test looking at the differences between the two groups found that there was a significant difference between the parental involvement group and the non-parental involvement group, $Z^*_{\text{diff}} = -1.07, p = .020$.

Finally, Pearson correlations were completed to look at the number of sessions compared to total effect size for the individual studies and at the length of sessions compared to the total effect size for the individual studies (Table 9). There was not a significant correlation between number of sessions and total effect size, $r(13) = -.15$ [95% CI: -0.63, 0.41], $p = .594$, which suggests that the number of sessions an individual completes does not affect the overall anxiety levels. Also, there was not a significant correlation between the length of sessions and total effect size, $r(13) = .58$ [95% CI: -0.48, 0.57], $p = .058$, which suggests that the length of the sessions does not affect the overall anxiety levels either.

Discussion

Past research has found that technology based interventions have been successful at decreasing anxiety in children and adolescents. The current study adds to this literature base by finding similar results. The first hypothesis of this study was that technology-based interventions would be effective at decreasing anxiety in children and adolescents. Overall, results show that technology based interventions such as inCBT, VRCBT, and CD-ROM CBT, are effective at

decreasing anxiety symptoms. The overall effect size for technology-based interventions combined had a medium effect on the anxiety levels reported (0.71). The technology-based interventions used for these studies were all CBT specific and specifically targeted anxiety symptoms. These results also continue up to 12 months after the end of treatment. When looking at the pre-intervention scores to the follow-up assessment scores (up to 12 months post the end of treatment) there was a large effect (1.01), suggesting that treatment gains continue post the termination of treatment.

These results were compared to the control group results. It was found that the overall control group had a small effect on the means (0.36). When comparing the two overall effect sizes, the technology-based interventions group had a larger effect on the anxiety levels than the control groups. When the control groups were broken a part, all three groups (waitlist, treatment as normal, and computer education) had significant effect sizes. The waitlist condition had a small effect on the anxiety levels (0.32) which could be due to time passing between assessment points. The treatment as normal condition had a medium effect on the anxiety levels (0.50). Finally, the computer education condition had a medium effect on the anxiety levels as well (0.57). Even when comparing the overall technology-based intervention effect size to the separate control group effect sizes, the technology group had a higher effect on the anxiety levels. Because this intervention type is effective at decreasing anxiety symptoms and maintain the reduction in symptoms after conclusion of treatment, it is a good treatment for individuals.

The second hypothesis of this study was to complete a preliminary exploration of the different technology-based interventions and their effectiveness as past research has not compared the different technology types in this area. Although we were not able to compare the three technologies due to the uneven group sizes, the effect sizes were still reported in the study.

Both inCBT and VRCBT were found to have a statistically significant effect size of reducing anxiety levels in individuals. inCBT was found to have a medium to large effect with an effect size of 0.79, and VRCBT was found to have a small to medium effect with an effect size of 0.37. CDROM CBT, on the other hand, did not have a statistically significant effect size with a small effect of 0.14. A reason as to why this occurred was because one of the two studies in this group had higher mean levels of anxiety at post than at pre. Cunningham et al. (2009) reported that the anxiety levels reported on the SCAS-C form had increased at the post assessment. This could be due to the fact that there were only 5 participants in the study, two of which were excluded in this study due to not completing all of the assessments, so any rise in one participant significantly affects the entire sample. Of the three participants, one reported significantly higher anxiety levels at post treatment than at pre-treatment, which resulted in the overall post anxiety means to be higher than the overall pre anxiety means for the study.

The third and fourth hypotheses of this study was that the number of sessions and length of sessions would be positively correlated with total effect size. Using Pearson correlations, it was found that there was no significant correlation between these variables. A potential reason as to why number of sessions was not correlated with total effect size is that there was not enough spread between number of sessions. There was one study (Keller, 2010) that only had three sessions, whereas the rest of the studies ranged between 8 and 12 sessions. In regards to length of sessions, there was more of a spread between the studies, but the results were still the same. A potential reasoning as to why the length of the session was not correlated with total effect size is related to the amount of work that can be done even in a short amount of time. During a traditional therapy session, therapists and clients typically spend the first 10-15 minutes catching up on things that have happened in the client's life since the last time they met. This is time that

could be spent completing activities directly related to their anxiety symptoms. Also, in traditional therapy, there is the potential for the client or the therapist to go on tangents that would detract from the direct interventions. During technology-based interventions, an individual can jump straight into completing the modules and working through the interventions without getting distracted or go on tangents. An individual could potentially get just as much done during a 15-minute technology-based session as a longer session.

When coding the articles for this study, we noticed that half of the studies had parental involvement in some way, and the other half of the studies did not have any parental involvement. Within the studies that did have parental involvement, it typically encompassed the parents completing some of the modules with the children and adolescents. Research has shown that a common challenge when working with children and adolescents with mental illness, parents may have some type of mental illness as well (Suveg et al., 2006). When treatment is able to get parents to be involved, often times the children and adolescents will have better outcomes such as lower number of symptoms, better support, and more coping skills (Suveg et al., 2006). A study performed by Pereira and colleagues (2016) found that higher levels of parental involvement resulted in the children being more likely to complete tasks related to therapy, be more open to exposure type activities, and have an overall greater treatment outcome than children with parents who are not involved. Through the analysis, we found that the parental and non-parental involvement groups were both significantly effective at decreasing anxiety levels. A Z-difference test showed that there was a significant difference between the two groups ($p = .020$). These results suggest that parental involvement in the treatment process will help reduce anxiety levels significantly in the youth. Getting the parents involved can help the youth to see that treatment is important. The parents will be able to learn the intervention techniques

and support/model these techniques for the kids outside of the intervention session. Parents who are involved in the treatment process are also be able to work through their own mental illness as well. By having parents also complete modules during the child's treatment, the parent is able to learn about the anxiety symptoms, learn about the skills used to decrease these symptoms, and can even use those skills for themselves for their own mental illness. A study performed by Aydin in 2014 found that getting parents involved in treatment by using psychoeducation, reducing parental anxiety, or improving the child-parent relationship can increase the efficacy of CBT with kids. When the parents are informed in this area, they are able to better support their children during the treatment process.

There are some limitations that apply to this study. First, the designs of the studies used were all different. Each study used different protocols, different outcome measures, different age ranges, different interventions, and different controls. Although random-effects statistics were used to account for these differences, some errors and biases could still occur that could have influenced the results in some way. Another limitation of this study is that there was an uneven amount of studies in each intervention group. This resulted in us not being able to truly compare the different groups in their effectiveness. Each study used self-report or parent-report outcome measures to measure anxiety levels. This can open up for some self-bias or bias from parents to either make the client look worse than they are or to make the client look better than they are. These outcome measures (both child-report and parent-report) were also reported all together in the overall effect sizes which could have impacted the results. There was also a limited spread in the number of sessions and length of sessions which impacted the results of the correlations. Finally, the level of parental involvement was not defined and looked at in this study. There may be differences in anxiety scores depending on how much parental involvement there is. For

example, there may be a large difference in the anxiety scores of kids whose parents completed one session compared to kids whose parents completed 12 sessions. It is important to keep these biases in mind when reading over this study and looking at the results.

There are a couple of things that future research may benefit from completing. First, future research may benefit from comparing the different technology types. Due to the uneven group size, the current study was not able to compare these interventions. Unfortunately, CD-ROM CBT may not be as popular in the coming years due to CD-ROMs becoming obsolete. However, VRCBT is becoming more popular and more research is being published on this particular intervention. Future research could compare the differences between inCBT and VR-CBT. Future research may also benefit from seeing if certain technology interventions are more effective with specific types of anxiety disorders and not others. For example, it may be that VRCBT is more effective with Social Anxiety Disorder and Phobias, but inCBT may be more effective with Generalized Anxiety Disorder. Future research may also benefit from defining parental involvement and looking at the impact that these different levels of parental involvement have on total effect size.

The current meta-analysis suggests that technology-based interventions are effective at decreasing anxiety levels and can be used as an alternative treatment to traditional therapy. Although this study was not able to compare the individual technology interventions, future research may benefit from doing this. CDROM CBT may be becoming obsolete due to the increase in computers that do not have CDROM drives, so this technology intervention may not be used as frequently in the future. VRCBT, on the other hand, is still a newer technology and more research is being published on this intervention. The current study also suggests that number of sessions and length of sessions may not have a large impact on the overall effect size.

for the studies. Finally, this study suggests that parental involvement is a moderator for total effect size. Getting parents involved in the treatment process can significantly reduce the youth's anxiety levels. However, although parental involvement was a moderator, both groups did have an overall effect on the anxiety levels suggesting that although parental involvement is ideal, receiving treatment without parental involvement is still better than receiving no treatment at all.

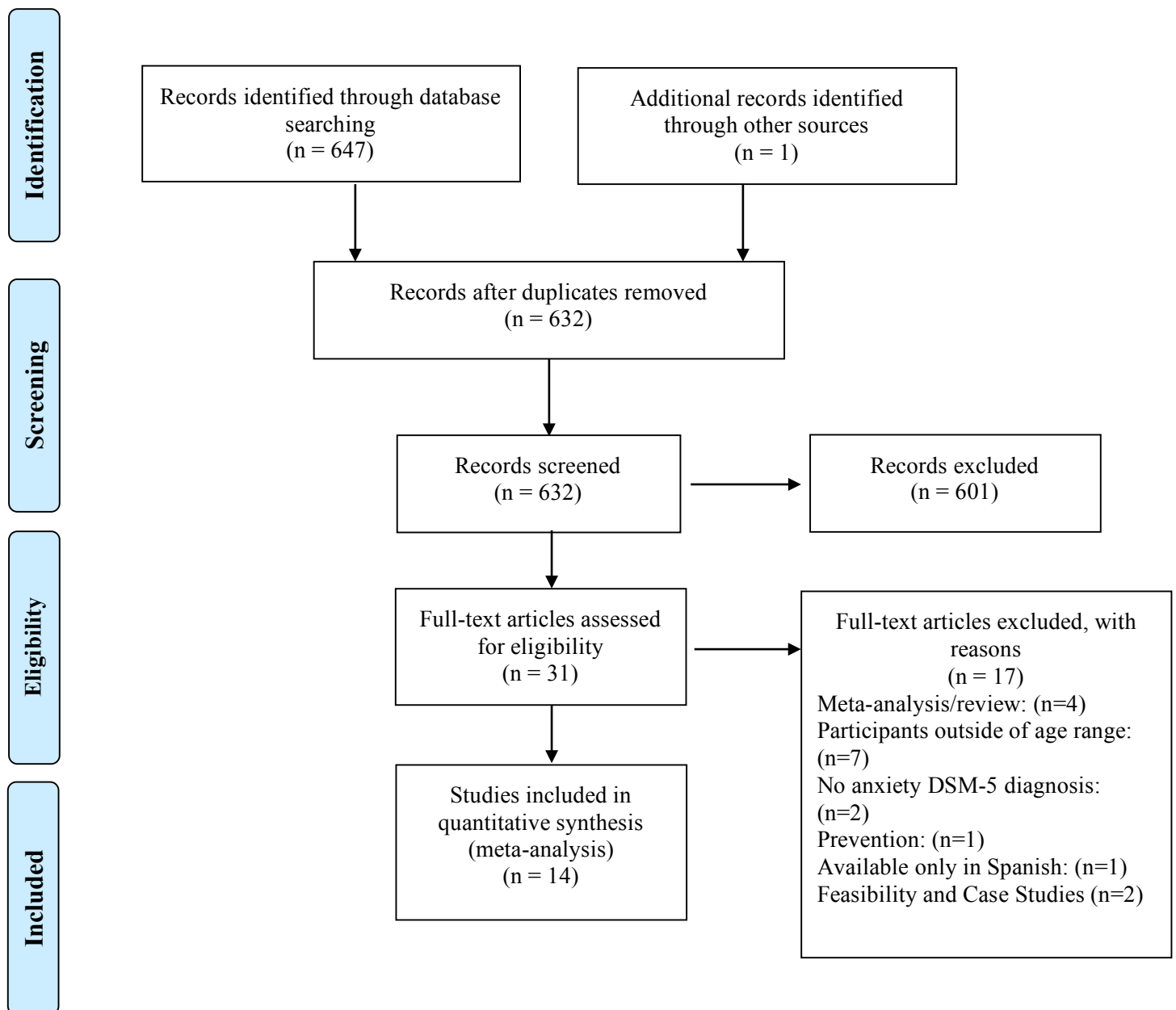


Figure 1. Flow diagram of the study selection process

Table 1

Countries the studies were conducted in

Country	N
Australia	6
USA	4
Sweden	3
Spain	1

Table 2

Percentage of Parental Involvement

Parental Involvement	57% (n = 8)
No Parental Involvement	43% (n = 6)

Table 3

Percentage of technology-based intervention used

Intervention	Percentage (N)
inCBT	79% (n = 11)
CDROM CBT	14% (n = 2)
VRCBT	7% (n = 1)

Table 4

Percentage of control nature used

Control	Percentage (N)
No Control	22% (n = 3)
Waitlist	50% (n = 7)
Traditional CBT	7% (n = 1)
Waitlist and Traditional CBT	14% (n = 2)
Traditional CBT and Computer Education	7% (n = 1)

Table 5

Number of sessions/modules for each study

Study	Number of Sessions/Modules
Crawford et al. (2014)	12
Cunningham et al. (2009)	8
Donovan & March (2014)	8
Keller (2010)	3
Khanna & Kendall (2010)	12
Maldonado et al. (2009)	8
March et al. (2009)	10
Spence et al. (2006)	10
Spence et al. (2011)	10
Storch et al. (2015)	12
Tillfors et al. (2011)	9
Vigerland et al. (2013)	11
Vigerland et al. (2016)	11
Wuthrich et al. (2012)	8

Table 6

Duration/length of sessions for each study

Study	Length of Sessions/Modules
Crawford et al. (2014)	50 minutes
Cunningham et al. (2009)	15 minutes
Donovan & March (2014)	60 minutes
Keller (2010)	*
Khanna & Kendall (2010)	35 minutes
Maldonado et al. (2009)	20 minutes
March et al. (2009)	60 minutes
Spence et al. (2006)	60 minutes
Spence et al. (2011)	60 minutes
Storch et al. (2015)	50 minutes
Tillfors et al. (2011)	*
Vigerland et al. (2013)	15 minutes
Vigerland et al. (2016)	*
Wuthrich et al. (2012)	30 minutes

*= Study either did not report length of sessions, or recorded it through number of pages read per session.

Table 7

Pre-intervention and post-intervention anxiety means for each study

Study	Measure	Pre-Intervention Anxiety Means			Post-Intervention Anxiety Means			Averaged Effect Size
		Mean	SD	N	Mean	SD	N	
Crawford et al. (2014)	PARS	16.40	2.70	15	9.60	4.00	15	0.940
	CAIS-C	11.70	10.70	14	7.00	9.20	14	
	CAIS-P	23.90	14.10	15	17.70	16.50	15	
	MASC	49.50	16.00	15	30.00	22.60	15	
Cunningham et al. (2009)	SCAS-C	16.67	7.37	3	28.00	23.90	3	-0.513
Donavan & March (2014)	PAS	46.57	15.96	23	30.05	14.67	19	1.057
Keller (2010)	CAIS-P	17.17	7.63	20	6.95	5.74	20	1.521
	RCMAS-C	12.63	4.78	20	7.79	3.74	20	
	SCARED-P	32.80	11.46	20	13.95	6.64	20	
Khanna & Kendall (2010)	MASC	50.50	12.80	16	35.20	12.30	16	1.188
Maldonado et al. (2009)	FSSCR	153.24	17.90	18	143.32	32.27	18	0.372
March et al. (2009)	SCAS-C	40.00	15.11	40	27.36	12.57	40	0.917
	SCAS-P	38.29	14.07	40	25.79	12.40	40	
Spence et al. (2006)	SCAS-C	41.30	21.22	27	27.25	16.82	27	0.770
	SCAS-P	31.67	9.42	27	21.02	12.12	27	
	RCMAS	53.70	13.17	27	45.33	13.48	27	
Spence et al. (2011)	SCAS-C	40.98	17.37	44	27.78	15.87*	41	0.553
	SCAS-P	27.43	12.92	44	23.59	10.82*	41	
Storch et al. (2015)	MASC	54.20	17.50	49	44.60	18.10	49	
	CAIS-C	23.80	16.00	49	14.50	15.80	49	
	CAIS-P	30.70	15.80	49	17.50	16.30	49	

Table 7 cont.

								0.644
Tillfors et al. (2011)	LSAS-FR Fear	23.80	11.80	9	14.60	8.20	9	
	LSAS-SR Av	21.40	13.60	9	15.00	9.10	9	
	SPSQ-C	14.80	2.20	9	12.20	2.70	9	
	BAI	17.60	8.40	9	10.40	6.30	9	
								0.830
Vigerland et al. (2013)	SCAS-C	25.50	10.00	30	19.80	10.00	26	
	SCAS-P	21.40	9.30	30	16.20	7.20	27	
	FSSC-R-C	123.60	22.90	30	113.20	22.90	26	
	FSSC-R-P	117.50	17.90	30	108.50	16.60	27	
								0.535
Vigerland et al. (2016)	SCAS-C	35.90	13.70	46	29.00	13.60	31	
	SCAS-P	32.50	9.30	46	25.70	11.20	33	
								0.577
Wuthrich et al. (2012)	SCAS-C	33.96	17.75	24	18.08	20.93*	24	
	SCAS-P	34.18	18.53	24	23.00	19.90*	24	
								0.688

* = Study reported standard error, standard deviation was calculated from standard error

reported. Averaged Effect Size is the hedges g total effect size for each study.

Table 8

Follow-up anxiety means for each study

Study	Measure	Follow-up Anxiety Means			Averaged Effect Size*
		<u>M</u>	<u>SD</u>	<u>N</u>	
Cunningham et al. (2009)	SCAS-C	20.33	23.96	3	-0.165
Donavan & March (2014)	PAS	18.62	11.94	13	
Khanna & Kendall (2010)	MASC	31.50	12.70	12	1.447
March et al. (2009)	SCAS-C	20.77	9.81	40	
	SCAS-P	18.52	9.63	40	1.560
Spence et al. (2006)	SCAS-C	27.30	22.29	27	
	SCAS-P	15.29	9.28	27	1.062
	RCMAS	45.65	3.32	27	
Spence et al. (2011)	SCAS-C	20.20	13.62*	37	1.175
	SCAS-P	15.86	8.94*	37	
Storch et al. (2015)	MASC	41.40	18.20	22	1.193
	CAIS-C	10.40	11.80	22	
	CAIS-P	7.10	6.60	24	0.530
Tillfors et al. (2011)	LSAS-FR Fear	16.70	7.60	14	
	LSAS-SR Av	17.40	8.80	14	0.762
	SPSQ-C	12.80	2.50	14	
	BAI	15.30	7.60	14	0.794
Vigerland et al. (2013)	SCAS-C	16.00	7.70	20	
	SCAS-P	15.50	7.60	24	0.932
	FSSC-R-C	109.40	16.30	20	
	FSSC-R-P	106.70	16.80	24	0.794
Vigerland et al. (2016)	SCAS-C	25.50	16.30	35	
	SCAS-P	22.70	12.00	35	0.932
Wuthrich et al. (2012)	SCAS-C	19.64	14.88	19	
	SCAS-P	18.92	10.02	19	

* = Averaged Effect Size is the hedges g total effect size for each study. The Average Effect Size was calculated using pre-intervention means and follow up means.

Table 9

Correlation between number of sessions and length of session to the total effect size.

	1	2	3
1. Number of Modules/Sessions	—		
2. Duration of Modules/Sessions (in minutes)	.267	—	
3. Total Effect Size for the Article	-.156	.587	—

* $p < .05$. ** $p < .01$. *** $p < .001$

Appendix A

Thesis Committee Approval Form

Thesis and Dissertation Guidelines | 26

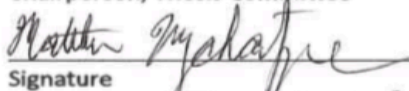
TOWSON UNIVERSITY
OFFICE OF GRADUATE STUDIES

THESIS COMMITTEE APPROVAL FORM

Student's Name

Kayla Little

Chairperson, Thesis Committee



Matthew Mychailyszyn

Signature

Typed name

Member

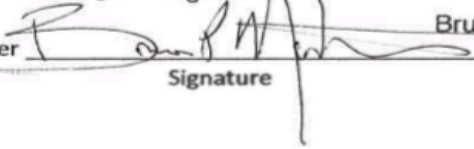


Sandra Llera

Signature

Typed name

Member



Bruce Mortenson

Signature

Typed name

Member

Signature

Typed name

Note: Please attach a description of the affiliation and credentials of any non-Towson University members of the Committee, and the members' *curriculum vita*.

Approved by

Graduate Program Director

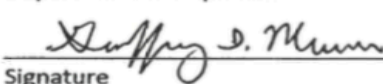


Signature

5/31/17

Date

Department Chairperson

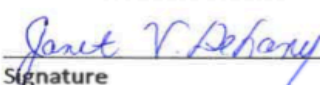


Signature

5/26/17

Date

Dean of Graduate Studies



Signature

May 31, 2017

Date

Note: It is the responsibility of the student to obtain all signatures *before beginning the proposal*.

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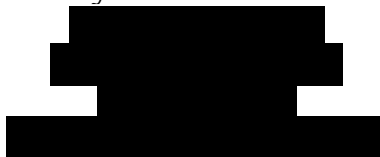
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outcome in cognitive-behavioral therapy for youth anxiety. *Journal of Clinical Psychology*, 71(4), 313-322. doi:10.1002/jclp.22167

Kayla Marie Little



Education:

M.A. (anticipated)	2018	Clinical Psychology Towson University, Towson, Maryland Thesis: <i>Technology-based interventions for anxiety disorders in youth: A meta-analysis</i> Advisor: Matthew Mychailyszyn, Ph.D
B.S.	2016	Psychology Stevenson University, Stevenson, Maryland Cumulative GPA: 3.990/4.000 Psychology GPA: 4.000/4.000
Diploma	2012	Havre de Grace High School, Havre de Grace, Maryland

Honors and Awards:

Graduate Research Grant 2018, Towson University, Towson, Maryland
 Dean's Award for Exceptional Scholarship 2016, Stevenson University, Stevenson, Maryland
 Dean's List 2015-2016, Stevenson University, Stevenson, Maryland
 Dean's List 2014-2015, Stevenson University, Stevenson, Maryland
 Who's Who Among Students in American Universities & Colleges 2015, Stevenson University, Stevenson, Maryland
 Dean's List 2013-2014, Stevenson University, Stevenson, Maryland
 Dean's List 2012-2013, Stevenson University, Stevenson, Maryland
 Dean's Scholarship 2012-2016, Stevenson University, Stevenson, Maryland

Professional Experience:

Clinical Intern, **Catholic Charities**, Baltimore, Maryland, August 2017-May 2018. Completed one-to-one cognitive behavioral therapy sessions with elementary school clients. Responsible for connecting with parents, completing family therapy sessions, completing individual therapy sessions, and completing group therapy sessions. *Supervisor: Aimee Hoffman, 20 hours weekly.*

Registered Behavior Technician, **Verbal Beginnings**, Columbia, Maryland, May 2016-Present. Works one on one with clients and provides services. Responsible for implementing individualized treatment goals and ABA protocols. Collects probe data for each target and completes session notes at the end of each session. *Supervisors: Jamie Harrell, 10 hours weekly.*

Administrative Intern, **Maryland Anxiety Center**, Towson, Maryland, April 2016-August 2016. Responsible for completing invoices, filing records, and researching

different topics regarding CBT therapy and adolescents/children. *Supervisor: Andrea Batton, 3 hours weekly.*

In Home Instructor, **Trellis Services**, Sparks, Maryland, December 2015-May 2016. Works one on one with clients and provides services. Responsible for implementing individualized treatment goals as well as developing new treatment goals. Takes progress notes at the conclusion of sessions and updates data sheets on behaviors. *Supervisor: Sarah Hammond, 6 hours weekly.*

Psychology Assistant, **Stevenson University**, Stevenson, Maryland, September 2015-May 2016. Responsible for assisting a psychology faculty member in scholarship and service. Performs data checking, helps with grant proposals, and helps with professional publications. Assists with clerical work such as making copies, research, and maintaining databases. *Supervisor: Dr. Virginia Iannone, 10 hours weekly.*

Peer Academic Coach, **Stevenson University**, Stevenson, Maryland, March 2015-May 2016. Assists and mentors students in the psychology department who are experiencing academic difficulties. Develops, implements, and monitors individualized plans to assist students with academic skills such as maximizing test performance, editing written work, implementing active reading strategies, taking organized notes, and managing time. *Supervisors: Dr. Jeff Elliott and Dr. Virginia Iannone, 5 hours weekly.*

Intern, **Chesapeake Therapeutic Riding**, Fallston, Maryland, July 2014- September 2014. Responsible for walking besides clients riding horses to keep them on the horse, instructing lessons, leading equine experiences, and writing lesson notes. *Supervisor: Cathy Schmidt, 15 hours weekly, 140 hours in total.*

Research Assistant, **Stevenson University**, Stevenson, Maryland, February 2013-April 2013. Codes emotions from transcripts of mothers talking to their 18-month olds for a research project investigating maternal mental state languages. *Supervisor: Emily Newton, PhD., 2 hours weekly.*

Professional and Honor Societies:

Eastern Psychological Association (EPA) (November 2015)
Alpha Chi, National College Honor Society (April 2014)
Psi Chi, International Honor Society in Psychology (March 2014)

Presentations and Publications:

Little, K.M. & Mychailyszyn, M.P. (2018, April). Technology based interventions for anxiety disorders in youth: A meta-analysis. Poster presented at the meeting of The Anxiety and Depression Association of America. Washington D.C.

Little, K.M., Henry, A.A., Schurtz, D.R. (March 2016). Love letters as interventions to decrease anxiety levels. Poster presented at the Eastern Psychological Association conference in New York City, New York.

Iannone, V. N., & **Little, K. M.** (February 2016). Fear of the fall: How to overcome fear and enjoy the ride. Presented to the Albaugh Road Pony Club. Mount Airy, Maryland.

Little, K.M., Henry, A.A., Schurtz, D.R. (December 2015). Love letters as interventions to decrease anxiety levels. Poster presented at the Psychology Student Showcase at Stevenson University, Stevenson, Maryland.

Little, K.M., Sauerwein, A., Patti, M., Tulloch, I. (May 2015). The effects of reading love letters on positive emotions. Poster presented at the Psychology Student Showcase at Stevenson University, Stevenson, Maryland.

Henry, A. & **Little, K.M.** (May 2015). The impact of perceived bullying on physical outputs. Poster presented at the Psychology Student Showcase at Stevenson University, Stevenson, Maryland.

Henry, A. & **Little, K.M.** (May 2015). Creation of a bullying prevention program for fourth and fifth graders. Poster presented at the Psychology Student Showcase at Stevenson University, Stevenson, Maryland.

Little, K.M. (December 2014). Assessing attitudes toward anxiety disorders in college students. Poster presented at the Psychology Student Showcase at Stevenson University, Stevenson, Maryland.

Little, K.M. (December 2014). Chesapeake Therapeutic Riding. Poster presented at the Psychology Student Showcase at Stevenson University, Stevenson, Maryland.

Little, K.M. (December 2014). Using positive punishment to reduce bad posture. Poster presented at the Psychology Student Showcase at Stevenson University, Stevenson, Maryland.

Eddy, S.K., **Little, K.M.**, Newton, E.K. (April 2014). Maternal mental state language: How mothers talk to their 18-month olds. Poster presented at the Psychology Student Showcase at Stevenson University, Stevenson, Maryland.

Narcisse, A., Bui, M., **Little, K.**, Butt, C. (April 2014) Gender differences in risk taking at crosswalks. Poster presented at the Psychology Student Showcase at Stevenson University, Stevenson, Maryland.

Research Qualifications/Clinical Skills

Computer Skills: Experience with basic commands in: Microsoft Office (Word, Excel, and PowerPoint) and Statistical Package for the Social Sciences (SPSS). Proficient in internet searches including Google and PsychInfo

Assessments: Differential Ability Scale-II (DAS-II), International Personality Disorder Examination (IPDE), The Minnesota Multiphase Personality Inventory (MMPI), NEO Personality Inventory-3 (NEO-PI-3), The Wechsler Adult Intelligence Scale-IV (WAIS-IV), The Wechsler Intelligence Scale for Children-5 (WISC-5).

Clinical Training: Manualized Cognitive Behavioral Therapy and Unified Protocol for Emotional Disorders

Training and Certifications:

Registered Behavior Technician, Behavior Analyst Certification Board, 2016. Certified in applied behavioral analysis for individuals with autism and other developmental disorders.

Basic Life Support for Health Care Providers (CPR Certified), American Red Cross, 2016. Certified in CPR as well as basic life support for children and adults including using AED devices.

References:

Dr. Elizabeth Katz, *Program Director: Clinical Psychology Master's Program*, Towson University, 8000 York Road, Towson, MD 21252. (410) 704-3072, ekatz@towson.edu

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Dr. Virginia Iannone, *Associate Professor Psychology*, Stevenson University, 1525 Greenspring Valley Road, Stevenson, MD, 21153. (443) 334-2510, viannone@stevenson.edu

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