# SUMMER CAMP EXPERIENCES FOR CHILDREN AND ADOLESCENTS WITH NEURODEVELOPMENTAL DISORDERS: A META-ANALYSIS

A thesis presented to the faculty of the Graduate School of Western Carolina University in partial fulfillment of the requirements for the degree of Master of Arts in Psychology.

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November 2021

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# LIST OF ABBREVIATIONS

American Camp Association (ACA)
American Psychiatric Association (APA)
American Speech-Language-Hearing Association (ASHA)
Attention Deficit/Hyperactivity Disorder (ADHD)
Autism Spectrum Disorder (ASD)
Children and Adults with Attention-Deficit/Hyperactivity Disorder (CHADD)
Communication Disorder (CD)
Comprehensive Meta-Analysis 2 (CMA-2)
Diagnostic and Statistical Manual of Mental Disorders (DSM)
Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)
Integrated, Multi-Diagnosis (IMD)
Integrated, Single-Diagnosis (ISD)
Intellectual Disorder (ID)
Movement Disorder (MD)
Neurodevelopmental Disorders (NDD)
Non-Integrated, Multi-Diagnosis (NIMD)
Non-Integrated, Single Diagnosis (NISD)
Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)
Specific Learning Disorder (SLD)

# ABSTRACT

SUMMER CAMP EXPERIENCES FOR CHILDREN AND ADOLESCENTS WITH NEURODEVELOPMENTAL DISORDERS: A META-ANALYSIS

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Summer camps have been the highlight of children's and parents' summer vacations for years. The American Camp Association (ACA; 2019) reports over 14,000 day and residential camps across the United States. These camps include recreational activities such as horseback riding, rock climbing, and boating, a chance to make friends and build community, and a chance to learn valuable new skills, such as how to build a fire or pitch a tent. Of these camps, the ACA reports that 44% have specialized programming targeted toward children and adolescents with specific diagnoses, illnesses, and disabilities. Specialized camps incorporate a combination of typical camp activities and therapeutic activities and are often believed to have a positive impact of their campers. Recent meta-analytic work documented the therapeutic value of camps for physical and chronic health conditions (Odar et al., 2013); however, a comparable review of specialized camps for individuals with neurodevelopmental disabilities does not yet exist. Therefore, this thesis aims to evaluate summer camp related outcomes in children and adolescents with neurodevelopmental disorders, as defined in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM; American Psychiatric Association [APA], 2013), through a meta-analysis following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)

guidelines (Moher et al., 2009) and guided by the methodology of Odar et al. (2013).

*Keywords*: summer camp, neurodevelopmental disorders, outdoor education and recreation, intervention

# CHAPTER ONE: INTRODUCTION

## Neurodevelopmental Disorders

Neurodevelopmental disorders (NDD) were first grouped and labeled as such in 2013 when the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) was published (American Psychiatric Association [APA], 2013; Morris-Rosendahl, 2020). NDDs are grouped based on shared elements, including an onset during the developmental period, impairments in social, personal, academic, and/or occupational functioning, and high rates of comorbidity (APA, 2013). Despite these commonalities, the clinical presentation of NDD varies, leading to the need for further classification. The NDD section in the DSM-5 is divided into six categories: intellectual disorders (IDs), communication disorders (CDs), autism spectrum disorder (ASD), attention-deficit/hyperactivity disorder (ADHD), specific learning disorder (SLD), and motor disorders (MDs; APA, 2013). Within each of these categories, individual disorders are further defined based on symptom type and severity. In addition, each category includes a diagnosis with a special classification of "unspecified," which encompasses all disorders with symptom presentations similar to, but not identical to, the specifically defined syndromes within the category.

### Intellectual Disorders

Intellectual disorders (IDs) occur in one percent of the population in the United States and are defined by global deficits in intellectual and adaptive functioning (APA, 2013; Maulik et al., 2011). These deficits can lead to impairment in the child's academic and social development and limitations to functioning in at least one activity of daily living. IDs may be noticed as early as infancy and early toddlerhood, during the acquisition of basic motor and speech skills, and

their course marked by stable or progressive delays. IDs may be caused by genetic factors, environmental factors, or a combination of both. Diagnoses included within the IDs are intellectual disability, global developmental delay, and unspecified intellectual disability.

In addition to impairments in academic, social, and developmental functioning, individuals with ID are more likely to have a comorbid condition, including seizure disorders, sleep disturbances, and scoliosis, which can negatively impact their quality of life (Reddihough et al., 2021). These impairments and comorbidities persist into adulthood for many individuals with ID, leading to a need for addition supports (e.g., specialized instruction, social skills training, interest counseling, personal assistance, in-home health care) across the lifespan (Wehmeyer & Thompson, 2016).

**Communication Disorders**

Communication disorders (CDs), as their name implies, are characterized by deficits in language, speech, and communication (APA, 2013). These deficits typically begin in late toddlerhood to early childhood, can remit in later years, and are often amendable to interventions. The diagnoses included under the umbrella of CDs include language disorder, speech sound disorder, childhood-onset fluency disorder (stuttering), social (pragmatic) communication disorder, and other specified and unspecified communication disorders. Each of these conditions can be caused by a variety of factors, including genetic and physiological variations.

**Autism Spectrum Disorder**

Autism Spectrum Disorder (ASD) is characterized by patterns of restricted/repetitive interests or behaviors and social communication deficits and occurs in an estimated 1 percent of the United States population (APA, 2013). Restricted/respective interests and behaviors are

classified by the presence of at least two of the following: stereotyped or repetitive motor movements, inflexible adherence to routines, patterns of behavior, or sameness, highly restricted and intense interests or focus, and abnormal reactions to sensory stimuli. Deficits in social communication and social interactions in individuals with ASD include restricted social-emotional reciprocity, underdeveloped nonverbal communicative behaviors, and difficulties developing, maintaining, and understanding relationships. ASD is life-long and typically has an onset in early toddlerhood, in some cases being diagnosed as early as 18 months of age.

Unlike the other NDD categories, the ASD category only includes this single diagnosis. However, ASD has multiple specifiers that can result in varied diagnoses. These specifiers identify the level of support individuals with ASD may need in the areas of social communication and interactions and restricted/repetitive behaviors, additional symptoms individuals with ASD may experience alongside the symptoms of ASD outlined in the DSM-5, including intellectual impairments, language impairments, medical, genetic, or environmental factors contributing to diagnosis, additional, related neurodevelopmental disorders, and catatonia (APA, 2013). The three levels of support that may be specified in the areas of social communication and interactions and restricted/repetitive behaviors are: (a) Level 1, requiring support, (b) Level 2, requiring substantial support, and (c) Level 3, requiring very substantial support. Each category is assigned a level of support based on the individuals' level of impairment, interference with day-to-day activities, and independence.

Individuals who have a diagnosis of ASD and below average intellectual functioning in one or more areas are classified as having ASD with accompanying intellectual impairment (APA, 2013). Similarly, individuals with ASD who have delayed, or poor verbal language skills would be classified as having ASD with accompanying language impairment and those with

catatonia symptoms would be classified as having ASD with catatonia. If the individual with ASD has an identifiable contributing factor to their ASD symptoms, then their diagnosis would include a specifier indicating this factor, and if they have an associated neurodevelopmental, mental, or behavioral disorder, they will have a specifier indicating this condition as well.

In a meta-analysis of developmental outcomes for children with ASD, ASD symptoms were observed to remain relatively stable, showing little improvements (Rosello et al., 2021). In the same meta-analysis, children with ASD were also shown to have persistent difficulties with executive dysfunction, social communication skills, adaptive skills, and a higher prevalence of comorbid psychiatric conditions. Individuals with ASD who continue to experience developmental impairments into adulthood have also been shown to have lower rates of academic attainment past ninth grade and lower rates of employment (Toft et al., 2021). Similar to individuals with ID, individuals with ASD require a variety of supports to navigate their personal limitations and be successful.

**Attention-Deficit/Hyperactivity Disorder**

Attention-Deficit/Hyperactivity Disorder (ADHD) occurs in 5 percent of children worldwide and is characterized by a pattern of inattention and/or hyperactivity and impulsivity (APA, 2013). Individuals with ADHD are diagnosed with one of three specifiers: predominately inattentive presentation, predominantly hyperactive/impulsive presentation, or combined presentation. Individuals with ADHD with predominately inattentive presentation are often easily distracted, have trouble sustaining attention, have poor organizational skills, frequently lose things, struggle to remember during daily activities, and more. Individuals with a predominately hyperactive/impulsive presentation are often fidgety, have trouble sitting still, are restless, talk excessively, interrupt others in conversation, and more. If an individual presents

with symptoms of both inattention and hyperactivity/impulsivity, they are diagnosed with ADHD combined presentation. ADHD begins in early childhood and persists into adulthood.

Around one third of children diagnosed with ADHD will continue to meet the diagnostic criteria for ADHD in adulthood and sixty to eighty percent will continue to experience symptoms of ADHD, though they may no longer meet diagnostic criteria (Barbaresi et al., 2013; Biederman et al., 2010a; Biederman et al., 2010b; Owens et al., 2015). These persistent symptoms can have a continued impact of the children's daily functioning as they shift into adulthood. Adolescents and adults with ADHD are more likely to drop out of high school, less likely to enroll in and complete a 4-year college program, more likely to be unemployed or in an unskilled employment position, and more likely to have been laid off or fired previously (Breslau et al., 2011; Kuriyan et al., 2013).

**Specific Learning Disorders**

Specific Learning Disorders are classified by difficulties learning and utilizing academic skills in one or more of the following areas: reading, written expression, and mathematics (APA, 2013). These learning-related difficulties begin during school-age years and often persist into adulthood. Individuals with SLD with impairment in reading may struggle with slow, effortful reading and poor reading comprehension. Those with impairment in written expression may have difficulty with spelling and grammatical and structural writing skills. Individuals with SLD with impairment in mathematics may struggle to master number sense and calculation skills and have trouble understanding mathematical reasoning.

**Motor Disorders**

Motor Disorders (MDs) are characterized by delays in motor coordination and skills, stereotypies, and/or tics and include developmental coordination disorder, stereotypic movement

disorder, Tourette's disorder, persistent (chronic) motor or vocal tic disorder, and provisional tic disorder (APA, 2013). MDs first appear in early development and may persist into later adolescence and adulthood. MDs occur in three to six percent of children in the United States.

## Interventions for Neurodevelopmental Disorders

Despite the wide range of individual disorders encompassed within the neurodevelopmental classification and the wide range of functioning areas impacted, many of the interventions across these disorders are similar (Cioni et al., 2016). Due to the early symptom presentations, symptom variance, and symptom persistence, early detection and symptom-targeted interventions for individuals with neurodevelopmental disorders is imperative. While a few neurodevelopmental disorders do present with unique symptoms that have specialized interventions (e.g., Comprehensive Behavioral Intervention for Tics), most present with some level of social, academic, speech or language, and physical symptoms (Frank & Cavanna, 2013). These more widespread symptoms are often treated though a combination of speech/language therapy, social skills training, physical therapy, occupational therapy, special education programs, parent training, and psychological therapy (American Speech-Language-Hearing Association [ASHA], n.d.; Autism Speaks, n.d.; Children and Adults with Attention-Deficit/Hyperactivity Disorder [CHADD], n.d.).

## Specialized Summer Camps as Intervention Settings

Summer camps have been a staple of the summer experience for children around the world for many years. In the United States alone, the American Camp Association (American Camp Association [ACA], n.d.-a) reports that there are over 14,000 day and residential camps across the United States, of which 2,400 are accredited. Summer camp experiences include a variety of settings, activities, time frames, and goals. These experiences are valued for their

entertainment, learning opportunities, and social connection opportunities. In recent years, these values have been expanded and applied to special populations and summer camps for children and adolescents with various disabilities or life challenges have emerged. Of the camps accredited by the ACA, over 300 have experiences targeted toward a special population (ACA, n.d.-b).

The value of these camps for a few special populations has been well-researched (Bateman, 1968; Burnes & Hassol, 1966; Corbett et al., 2014; Hantson et al., 2012; Michalski et al., 2003). In addition, summer camp outcomes research has been the target of recent special issues in the *Journal of Outdoor Recreation, Education, and Leadership* (Hill et al., 2021; Leary et al., 2021). An increase in self-esteem, decrease in feelings of loneliness, and an increase in social competence was identified for a group of 96 campers attending a camp for children with learning disorders and other psychosocial disorders (Michalski et al., 2003). In addition, the parents of the campers reported that their children were more cooperative, more responsible, and had greater self-control after attending camp (Michalski et al., 2003). Across several studies with children and adolescents with various neurodevelopmental disabilities, gains were reported in sensory-motor performance, social responsiveness, affect perceptions, peer relationships, and more (Bateman, 1968; Burnes & Hassol, 1966; Corbett et al., 2014; Hantson et al., 2012). Summer camp settings, like support group settings, may serve as a context to build social connections and make positive strides toward self-improvement for children with and without special needs. For children with special needs, these camps can provide therapeutic benefits that could improve their quality of life.

**Outcomes of Specialized Camps for Youth with Chronic Health Conditions**

Odar, Canter, and Roberts (2013) evaluated these positive impacts, specifically changes

in self-perception, which were found to be the most recorded effect of summer camp experiences for children and adolescents with chronic health conditions. The meta-analysis revealed a positive increase in self-perception across the included 31 studies assessing self-perception changes after attending a specialized camp. In addition to the meta-analysis, Odar et al. (2013) addressed the varied methods of assessing and operationally defining self-perception changes in each of the 31 included articles utilized. In a study with 90 children with asthma and diabetes, attitudes toward their illness and overall anxiety levels significantly improved after attending a one-week camp (Briery & Rabian, 1999). Overall, specialized camps for youth with chronic health conditions have been shown to beneficial.

## Purpose of the Review

Although Odar et al. (2013) documented the value of therapeutic summer camps for physical and chronic health conditions in their meta-analysis, a comparable review of summer camp interventions for neurodevelopmental disorders does not exist. Therefore, this present review aims to provide a meta-analysis of the available research related to summer camp outcomes for children and adolescents with NDD. Using meta-analytic review methods, this thesis aims to summarize and evaluate (a) the outcomes of summer camp interventions for children and adolescents with NDD, (b) the structures of the included camps, (c) the intervention techniques utilized, and (d) the limitations of the current literature.

# CHAPTER 2: METHOD

## Method

The methodology of this project was informed by and conformed to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and included (a) an identification of sources, (b) screening and inclusion, and (c) coding and analysis phases (Moher et al., 2009). Each phase was explicitly documented and is described in detail below.

### Identification of Raters

A total of three independent raters were included in the screening phase of this study. Two of the raters were graduate-level students involved in a research laboratory focused on NDD research. Each student was provided the inclusion and exclusion criteria and search terms and rated all identified articles. A third rater, who was a doctorate-level professor in the same research laboratory, reviewed all articles where raters indicated different decisions and identified the final inclusion or exclusion decision for this phase. Overall interrater agreement between the two initial raters was 85 percent agreement.

### Identification of Sources

To identify a comprehensive list of published literature on summer camp interventions and outcomes for children and adolescents with NDD, literature searches were conducted within a professional psychology database. Within the professional psychology database, PsycInfo, searches were performed using the following neurodevelopmental keywords: (a) *intellectual*, (b) *global development**, (c) *language*, (d) *(speech or sound)*, (e) *child* fluency*, (f) *social communic**, (g) *autis**, (h) *learn* disabil**, (i) *develop* coordin**, (j) *stereo* move**, and (k) *(tic* or touret*)* combined with the keyword *camp**. The keywords *not politic** and *not advert**

were also included, as initial reviews revealed multiple sources related to political and social advertising. Similarly, the keyword *not campaign* was included with the keywords *social communic** and *camp**. All articles identified prior to May 31, 2021, were included for review.

## Inclusion and Exclusion Criteria

Articles that (a) were available in English, (b) published, peer-reviewed, (c) examined the impact of summer camp, (d) included at least one quantitative outcome variable, and (e) had a sample that includes children and adolescents with NDDs, as defined by DSM-5, were eligible for inclusion.

### *English*

Articles were eligible for inclusion if they were available in English at the time of the search. This includes articles that were professionally translated into English and those that were originally written in English. Articles not available in English were excluded from the review.

### *Published, Peer-Reviewed*

All articles published in a peer-reviewed journal were eligible for inclusion. Dissertations, theses, research symposium abstracts, book chapters, and books were excluded.

### *Impact of Summer Camp*

Eligible articles must have addressed the impact of summer camp settings on various outcome constructs: (a) social, (b) emotional, (c) behavioral, (d) cognitive, (e) academic, and (f) physical. Summer camps, for the purpose of this study, were defined as experiences that were (a) in a separate location from the participants' domicile, (b) occurred away from the participants' primary caregivers, (c) were one day or longer in duration, (d) included multiple participants, and (e) included recreational and educational activities (Odar et al., 2013). Articles that included summer camp experiences meeting the above guidelines and focused on outcomes of these

camps satisfied this inclusion criterion. Summer camp experiences included in the screened articles were evaluated on various characteristics such as interventions included, populations served (e.g., diagnosis specific, mixed diagnoses, mixed diagnosed and non-diagnosed), number of participants, and type of camp (e.g., residential, day, afterschool) in the data analysis phase of this project.

### *Quantitative Outcome Variable*

At least one camp-related, camper outcome variable of all eligible articles must be quantitative. Articles utilizing qualitative research methodology exclusively were excluded.

### *Neurodevelopmental Disorders Population Sample*

All eligible articles must have included children /or adolescents with a NDD in the sample. Articles that included children or adolescents without NDD and/or adults with NDD in addition to children and/or adolescents with NDD were eligible for inclusion.

## Screening and Inclusion Decisions

Based on methodology outlined in the PRISMA guidelines, inclusion decisions were made through two phases, the initial screening phase and the final inclusion screening phase. During the initial screening phase, decisions were logged in an Excel spreadsheet by each independent rater. Within this spreadsheet, the following information was included: (a) search terms, (b) number of search results returned, (c) title of all results sorted by search term, (d) format for each returned result entry (e.g., article, book, chapter, review, etc.), (d) ratings assigned by each rater, and (e) reasons for exclusion, if applicable. The Excel file was used to tally the total number of resources screened, included, and excluded.

### *Initial Screening Phase*

During this screening process, all PsycInfo keyword searches were conducted as

described above. Duplicate items returned across searches were recorded as duplicates and tallied separately from the total number of articles screened. Results were screened for the next phase of decisions based on their title and abstract. While screening the title and abstract of all search results, raters included all results that included a summer camp setting or intervention and a population that included children and/or adolescents with neurodevelopmental disabilities. Ten percent of the search results from each category, selected at random, were screened by a second rater. Any disagreements in screening decisions were decided by a third rater. Articles that passed the initial screening moved to the second screening phase. All other articles were excluded from any further study methodology and exclusion reasons were noted.

### *Final Inclusion Screening Phase*

During the final inclusion screening phase, all articles included after the initial screening phase were read in their entirety by a single rater. Each article was rated on each of the five inclusion criteria. If any of the criteria were not met, the article was excluded, and the unmet criterion was recorded in the Excel file. A second rater was consulted in the event that an article's inclusion or exclusion was unclear. All articles included after this screening phase moved to the data coding and analysis phase of the project.

## Data Collection and Coding

All included articles were thoroughly reviewed and coded regarding variables outlined below. In addition, each article's (a) title, (b) authors, (c) publication year, (d) format (e.g., journal article, book chapter), (e) peer-reviewed status, (f) number of participants, (g) age of participants, (h) education level of participants, (i) socio-economic status of participants, (j) sex of participants, and (k) diagnoses included, were coded when available. All information was recorded in a pre-designed Comprehensive Meta-Analsis-2 (CMA-2) data file.

### *Camp Specifics*

When available, data related to the summer camp settings was coded. This data included the name of the camp or camp organization, the year of the included camp sessions, the type of camp (i.e., residential, day), the length of the camp session (e.g., three days, one week, one month), the integration of the camp population (i.e., non-integrated, single diagnosis [NISD], non-integrated, multi-diagnosis [NIMD], integrated, single diagnosis [ISD] and integrated, multi-diagnosis [IMD]), and the types of activities included in the camp session (e.g., biking, hiking, boating, arts and crafts, archery, group games).

### *Outcome variables*

To evaluate the impacts of summer camp interventions, all outcome variables presented in the included articles were coded, along with the construct (i.e., social, emotional, behavioral, cognitive, educational, or physical), associated intervention(s) (e.g., psychological therapy, occupational therapy, speech/language therapy, tutoring), assessment measure(s), validity measure(s), and timeframe of the variable (e.g., post-intervention, pre-intervention, six-month follow-up).

## Analyses

All analyses were conducted in Comprehensive Meta-Analysis-2 (CMA-2; Borenstein et al., 2005) software package.

### *Interobserver Agreement*

Interobserver agreement between the two independent raters was calculated following initial screening. For categorical variables, percent agreement and Cohen's *k* were calculated. For continuous variables, Pearson's *r* was calculated.

### *Effect Sizes*

Effect sizes were computed for all included outcomes of interest. For variables where sufficient raw data was reported, Cohen's *d* was calculated. For all other variables, Pearson's *r* was calculated. For articles that include multiple coded variables, effect size was calculated for each variable. In addition, one overall effect size was calculated for each of the main outcomes: (a) social, (b) emotional, (c) behavioral, (d) cognitive, (e) educational, and (f) physical. In the event that the article included multiple measures of a single construct, the overall effect size for the construct was calculated by averaging the effect sizes across the measures.

### *Summarizing Overall Effects of Camp*

To evaluate the overall effect of summer camp interventions, study interventions were compared regardless of outcome. Effect sizes were weighted based on the inverse variance to ensure that variables with larger sample sizes were weighted more (Lipsey & Wilson, 2001). In instances where a study included multiple effect size calculations for the sample, an overall effect size for the sample was used to ensure that samples were not counted more than once. Tests of heterogeneity were conducted to evaluate variance in effect sizes. The *Q* statistic was used to determine if the variability was more than would be expected due to sampling error and the $I^2$ statistic was used to determine if the variability was primarily due to variance between studies (Cooper, 2017).

### *Testing Moderators of Effects of Camps*

Moderator analyses were conducted to further understand the impact of summer camp interventions. These analyses included the following as moderators: (a) outcome, (b) target population diagnosis, and (c) type of camp session. Meta-regression analyses were conducted to evaluate the impact of age and gender of participants and camp session length related to overall summer camp outcomes.

### *Publication Bias*

The fail-safe *N* was used to assess publication bias, or the number of published studies with null results needed to indicate insignificant cumulative findings (Lipsey & Wilson, 2001). A funnel plot and Kendall's $\tau$ was used to evaluate the relationship between effect size and standard error and effect size and study samples, respectively (Lipsey & Wilson, 2001).

### *Effect Modeling*

Given the variability in study design and procedures across the included articles, a random effects model was supported and used for synthesizing effects and conducting the moderator analyses (Lipsey & Wilson, 2001). However, given the limited number of articles ($n$ = 18) included in the final analyses, random effect models may be too conservative, and thus fixed effect models are also reported (Copper, 2017).

# CHAPTER 3: RESULTS

## Study Exclusion and Inclusion

The electronic database search identified 476 studies, of which 8 were duplicates and 450 were excluded. During the initial screening phase, 413 articles were excluded due to not meeting screening criteria following title and abstract reviews. At the inclusion decision phase, 18 articles met eligibility criteria and 37 articles were excluded following full-article reviews. Of these excluded articles, three were excluded for publication languages other than English, two were excluded for lack of a summer camp experience, 18 were excluded for lack of quantitative outcome variables, and six were excluded for the lack of a sample population including children and/or adolescents with neurodevelopmental disorders. Three additional article(s) were excluded due to insufficient data reporting, resulting in the inability to analyze the study. Four additional studies were excluded due to single-case designs and one additional study was excluded due to failure to meet the peer-reviewed journal article criterion (see Figure 1 for PRISMA flowchart).

## Descriptive Information for Included Studies

### *Article Information*

Articles included in the study were published between the years of 1966 and 2016 and published in print format. The articles were published in a variety of medical, psychological, and recreational research journals. The included articles utilized a variety of designs: (a) seven utilized a pre-/post- design, (b) three utilized a pre-/post- with control group design, (c) one utilized a pre-/post-/follow-up design, (d) one utilized a pre-/post-/follow-up with control design, and (e) six utilized another design. Of the studies that included pre-intervention data collection, data were collect from zero to fifteen days prior to intervention. Post-intervention data collection

ranged from zero days to six weeks post intervention for the included studies. Of the five articles including follow-up data collection, follow-up time periods ranged from 19 days to eight months. The included studies also utilized a variety of participant recruitment strategies, including community recruitment, school recruitment, and clinic recruitment (see Table 3 for full descriptive information).

### *Camp Information*

Camp sessions for the included articles ranged from 1970 to 1998, with 15 articles failing to report camp intervention year. However, all included articles were published between 1966 and 2016, indicating that camp outcome data were collected in more recent years, despite this information being left unreported. Camp session lengths ranged from one to eight weeks. Three articles failed to report camp session length. Six camp experiences were classified as residential, nine were classified as day, and two did not include a classification. Twelve camp populations were non-integrated (11 single-diagnosis and one multi-diagnosis) and five were integrated (two single-diagnosis and three multi-diagnosis). One article failed to report integration status (see Table 3 for full camp information).

### *Participant Information*

A total of 941 participants were included in the meta-analysis from the contributing articles. The mean age of all participants was 9.65 years, with two studies failing to report participant ages. Of these participants, 728 were members of experimental groups and 213 were members of control groups. 72.91 percent of participants were male, with seven studies failing to report gender or sex data for participants. Across the included articles target diagnostic populations varied and were as follows: (a) 257 met diagnostic criteria for an intellectual disorder, (b) 28 met diagnostic criteria for a communication disorder, (c) 29 met diagnostic

criteria for autism spectrum disorder, (d) 112 met diagnostic criteria for a specific learning disorder, (e) 427 met diagnostic criteria for attention deficit/hyperactivity disorder, and (f) 37 met diagnostic criteria for a tic disorder. Six studies reported additional participant data, including education status, Intelligence Quotient (IQ), and familial socio-economic status (SES).

### *Outcomes*

Of the included articles, eight included assessment measures of social outcomes, six of emotional outcomes, eight of behavioral outcomes, eight of cognitive outcomes, two of educational outcomes, and five of physical outcomes.

## Overall Effect Size and Homogeneity Analysis

### *Fixed Effect Model*

There was a medium-to-large effect size of camp experience, $d = 0.510$, 95% CI [0.439, 0.580] across the 18 studies (see Figure 2). The overall effectiveness of summer camp interventions on the previously identified outcomes for children and adolescents with NDDs was significant ($Z = 14.250$, $p < .01$). Heterogeneity among all dependent variables was significant ($Q$ (17) = 62.455, $p < .01$ and $I^2 = 72.780$).

### *Random Effect Model*

There was a medium-to-large effect size of camp experience, $d = 0.756$, 95% CI [0.547, 0.965] across the 18 studies (see Figure 3). The overall effectiveness of summer camp interventions on the previously identified outcomes for children and adolescents with NDDs was significant ($Z = 7.086$, $p < .01$). Heterogeneity among all dependent variables was significant ($Q$ (17) = 62.455, $p < .01$ and $I^2 = 72.780$).

## Moderator Analysis

### *Fixed Effect Models for Outcomes*

Moderator analyses were conducted to evaluate the effect sizes of the outcome types included in this review: social, emotional, behavioral, cognitive, educational, or physical. Camp interventions assessing social outcomes produced a medium effect size ($k$ = 8, $d$ = 0.436, 95% CI [0.302, 0.570], $p$ < .01), emotional outcomes produced a medium effect size ($k$ = 6, $d$ = 0.471, 95% CI [0.306, 0.636], $p$ < .01), behavioral outcomes produced a large effect size ($k$ = 8, $d$ = 0.632, 95% CI [0.548, 0.717], $p$ < .01), cognitive outcomes produced a medium effect size ($k$ = 7, $d$ = 0.364, 95% CI [0.288, 0.441], $p$ < .01), educational outcomes produced a large effect size ($k$ = 2, $d$ = 0.982, 95% CI [0.466, 1.498], $p$ < .01), and physical outcomes produced a large effect size ($k$ = 5, $d$ = 1.078, 95% CI [0.728, 1.427], $p$ < .01) (see Table 1).

***Random Effect Models for Outcomes***

Moderator analyses were conducted to evaluate the effect sizes of the outcome types included in this review: social, emotional, behavioral, cognitive, educational, or physical. Camp interventions assessing social outcomes produced a large effect size ($k$ = 8, $d$ = 0.614, 95% CI [0.336, 0.892], $p$ < .01), emotional outcomes produced a large effect size ($k$ = 6, $d$ = 0.616, 95% CI [0.289, 0.943], $p$ < .01), behavioral outcomes produced a large effect size ($k$ = 8, $d$ = 0.853, 95% CI [0.536, 1.170], $p$ < .01), cognitive outcomes produced a large effect size ($k$ = 7, $d$ = 0.736, 95% CI [0.414, 1.059], $p$ < .01), educational outcomes produced a large effect size ($k$ = 2, $d$ = 0.908, 95% CI [-0.238, 2.054], $p$ = .120), and physical outcomes produced a large effect size ($k$ = 5, d = 0.855, 95% CI [0.253, 1.457], $p$ < .01) (see Table 1).

***Fixed Effect Models for Diagnostic Group***

Moderator analyses were conducted to evaluate the effect sizes across the diagnostic populations included in this study. Camp interventions for individuals with ASD produced a large effect size ($k$ = 3, $d$ = 0.606, 95% CI [0.220, 0.992], $p$ < .01), for individuals with ID

produced a large effect size ($k = 6$, $d = 0.563$, 95% CI [0.346, 0.781], $p < .01$), for individuals with MD produced a medium effect size ($k = 1$, $d = 0.323$, 95% CI [-0.009, 0.656], $p = .057$), for individuals with ADHD produced a large effect size ($k = 6$, $d = 0.526$, 95% CI [0.444, 0.609], $p < .01$), for individuals with CD produced a medium effect size ($k = 1$, $d = 0.304$, 95% CI [-0.492, 1.100], $p = .454$), and for individuals with SLD produced a medium effect size ($k = 3$, $d = 0.473$, 95% CI [0.264, 0.682], $p < .01$) (see Table 1).

***Random Effect Models for Diagnostic Group***

Moderator analyses were conducted to evaluate the effect sizes across the diagnostic populations included in this study. Camp interventions for individuals with ASD produced a large effect size ($k = 3$, $d = 0.639$, 95% CI [-0.014, 1.292], $p = .055$), for individuals with ID produced a large effect size ($k = 6$, $d = 0.962$, 95% CI [0.304, 1.621], $p < .01$), for individuals with MD produced a medium effect size ($k = 1$, $d = 0.323$, 95% CI [-0.009, 0.656], $p = .057$), for individuals with ADHD produced a large effect size ($k = 6$, $d = 1.008$, 95% CI [0.552, 1.463], $p < .01$), for individuals with CD produced a medium effect size ($k = 1$, $d = 0.304$, 95% CI [-0.492, 1.100], $p = .454$), and for individuals with SLD produced a medium effect size ($k = 3$, $d = 0.543$, 95% CI [0.229, 0.856], $p < .01$) (see Table 1).

***Fixed Effect Models for Camp Integration Status***

Moderator analyses were conducted to evaluate the effect sizes of camp integration statuses included in this study. Camp interventions within a non-integrated, single diagnosis setting produced a large effect size ($k = 10$, $d = 0.517$, 95% CI [0.442, 0.592], $p < .01$). Camp interventions within a non-integrated, multi-diagnosis setting produced a large effect size ($k = 3$, $d = 0.707$, 95% CI [0.283, 1.130], $p < .01$). Camp interventions within an integrated, single diagnosis setting produced a medium effect size ($k = 2$, $d = 0.394$, 95% CI [-0.053, 0.840], $p =$

.084). Camp interventions within an integrated, multi-diagnosis setting produced a large effect size ($k$ = 2, $d$ = 1.511, 95% CI [0.882, 2.141], $p$ < .01) (see Table 1).

***Random Effect Models for Camp Integration Status***

Moderator analyses were conducted to evaluate the effect sizes of camp integration statuses included in this study. Camp interventions within a non-integrated, single diagnosis setting produced a large effect size ($k$ = 10, $d$ = 0.829, 95% CI [0.555, 1.104], $p$ < .01). Camp interventions within a non-integrated, multi-diagnosis setting produced a large effect size ($k$ = 3, $d$ = 0.707, 95% CI [0.283, 1.130], $p$ < .01). Camp interventions within an integrated, single diagnosis setting produced a medium effect size ($k$ = 2, $d$ = 0.394, 95% CI [-0.053, 0.840], $p$ = .084). Camp interventions within an integrated, multi-diagnosis setting produced a large effect size ($k$ = 2, $d$ = 1.565, 95% CI [0.746, 2.385], $p$ < .01) (see Table 1).

***Fixed Effect Models for Camp Type***

Moderator analyses were conducted to evaluate the effect sizes of camp types included in this study. Camp interventions within a residential camp setting produced a large effect size ($k$ = 6, $d$ = 0.516, 95% CI [0.349, 0.683], $p$ < .01). Camp interventions within a day camp setting produced a large effect size ($k$ = 9, $d$ = 0.540, 95% CI [0.459, 0.621], $p$ < .01) (see Table 1).

***Random Effect Models for Camp Type***

Moderator analyses were conducted to evaluate the effect sizes of camp types included in this study. Camp interventions within a residential camp setting produced a large effect size ($k$ = 6, $d$ = 0.709, 95% CI [0.309, 1.110], $p$ < .01). Camp interventions within a day camp setting produced a large effect size ($k$ = 9, $d$ = 1.023, 95% CI [0.657, 1.389], $p$ < .01) (see Table 1).

***Gender***

A meta-regression was used to evaluate the relationship between participant gender and

summer camp intervention effectiveness. No significant relationship was noted between the percentage of male participants (72.91 %) and effect size, $b = 1.510$; $z$ (10) = 1.523, $p = .128$ (see Table 2).

### *Age*

A meta-regression was used to evaluate the relationship between participant age and summer camp intervention effectiveness. A significant relationship was noted between the mean age of participants (9.62) and effect size, $b = 0.952$; $z$ (15) = 3.813, $p < .01$ (see Table 2).

### *Camp Length*

A meta-regression was used to evaluate the relationship between camp length and summer camp intervention effectiveness. A significant relationship was noted between the mean length of camp sessions (3.83) and effect size, $b = 0.592$; $z$ (14) = 5.635, $p < .01$ (see Table 2).

## Reporting Bias

A fail-safe *N* was computed to identify the number of unpublished studies with null results required to produce an insignificant overall effect size. To reduce the cumulative effect size across all studies to insignificance, a total of 750 unpublished, null studies would be required.

A visual analysis of a funnel plot was used to assess for the biased reporting of effect size as related to small sample size bias (see Figure 4). A total of 7 studies fell outside of the funnel in a symmetrical pattern, indicating a similar number of articles with large and small effect sizes with large standard errors across the literature. A Kendall's tau correlation ($\tau$) was conducted to further evaluate the relationship between sample size and effect size of the summer camp interventions. This analysis revealed no significant correlation ($\tau = 0.242$, $p = .161$).

# CHAPTER 4: DISCUSSION

Summer camp interventions were hypothesized to have an overall positive impact across outcomes, participants' diagnoses, age, and gender, and camp session type, integration status, and length. Analysis results across all outcomes in all eighteen included studies revealed significant changes in the positive direction with effects ranging from medium to large. Moderator analyses revealed significant positive changes across each outcome of interest, with effect sizes ranging from medium to large. These results supported the hypothesis that summer camp interventions would have an overall positive impact on participants in each outcome category.

Further moderator analyses conducted revealed positive outcome changes regardless of camp session type. In addition, meta-regression analyses revealed no significant relationship between effect sizes and participant gender. However, meta-regression analyses revealed a significant relationship between effect size and participant age. Findings further support the hypothesis that summer camp interventions have an overall positive impact for individuals with NDDs regardless of gender expression but imply that campers with higher developmental ages may experiences more positive effects. Moderator analyses for camp integration status and participant diagnosis and meta-regression analyses for camp session length indicated varying significance. More specifically, there was no significant change in outcomes for studies that included ISD camp settings and participants diagnosed with MD or CD, while there was a significant change in outcomes for all other camp settings (i.e., NISD, NIMD, and IMD) and participant diagnoses (i.e., ID, ASD, ADHD, SLD). There was a significant relationship between effect size and camp session length. These results suggest that positive outcome effects may vary based on integration status, participants' diagnoses, and camp session length. These results

should be interpreted with caution, as the number of studies including ISD camp settings and participants with MD and CD were limited to two, one, and one, respectively, and included small samples.

Overall, summer camp interventions were shown to produce overall medium or large effects on the identified outcomes, with some less notable effects for participants with MD or CD and for studies that included camps that were integrated, single-diagnosis settings and shorter in length. However, it should be noted that only one study included a MD and CD population, leading to a limited contribution to the overall analysis and limited summary of the results for these populations. The lack of significant effects for these two groups should be interpreted with caution. Similarly, no effect was noted for camps with an integrated, single-diagnosis setting. Only two of the included studies presented on an integrated, single-diagnosis camp setting, which leads to the same need for cautious interpretation of lack of effect.

**Limitations**

The results of this meta-analysis should be examined cautiously, as there are limitations to the study. To begin, the present study identified 18 articles that met all eligibility criteria and were included in the analysis. While this sample size is sufficient for analysis, it is limited. In addition, many of the included articles had small sample sizes in their studies. Small sample sizes can lead to inflated effect sizes, which in turn can lead to overgeneralization and misinterpretation of results. Given the small sample sizes of the article and the limited number of articles eligible for inclusion, it is reasonable to utilize and report a fixed effect model (Cooper, 2017). However, given the wide variability in study designs and methodology across the included articles, it is also reasonable to utilize and report a random effects model (Lipsey & Wilson, 2001). Both Cooper (2017) and Lipsey and Wilson (2001) agree that it is best practice to

only report one model type, however, as discussed previously, the present meta-analysis includes both models.

The small number of eligible articles may be attributed to the limited search umbrella. Literature searches were only conducted within the PsycInfo database and did not include any additional journal searches or ancestral searches. Only the initial screening phase included multiple raters. Thus, interrater reliability was only calculated at this phase. When coding data from the articles, all quantitative outcomes of focus were included. A portion of the articles included multiple measures of the same outcome. When this occurred, a total score value was chosen when available (i.e.: SRS Summative Rating) and in all other cases, an aggregate variable was created by averaging the effect sizes. This method may remove some level of variance and effect across the data, and thus results should be interpreted with caution.

**Implications for Practice**

The results suggest that summer camp interventions are an effective option for children and adolescents across a variety of outcomes. However, the literature is limited, and these results do not generalize to all included populations and camp settings and varied in regard to participant age and camp session length. The studies that included the populations and camp settings that were not shown to be effective were even more limited, indicating a need for more studies with larger samples of children and adolescents with MDs and CDs and including integrated, single-diagnosis camp settings. However, the variation in results related to participant ages and camp session lengths implies that camp sessions with longer intervention times and developmentally older participants may be most successful. This information is important for personnel planning a summer camp intervention to consider. Camp sessions that are longer in length provide additional time for intervention techniques and social interaction, which are

potential mechanisms for the increased effect noted in analysis. Similarly, an increased developmental age in campers implies that participants are more developmentally ready for intervention.

## Methodological Critique of Camp Research for NDD

Review of the included studies revealed a wide array of research designs, participant numbers, and information collected. In many studies, participant demographic information was not reported, including participant age, gender, race and ethnicity and intellectual abilities. The included studies also failed to report camp setting specifics on multiple occasions, including integration status, length of session, and activities and interventions included. As shown in this analysis, these variables are key in determining the characteristics of both campers and camps that lead to successful interventions and can impact how these camps are designed and utilized in practice. In addition, some of the identified assessment measures used within the included studies have notably less rigorous validation and reliability, leading to less generalizable outcomes and need for further validation and support. It is also important to note that many of the included studies are dated and results have not been replicated. Additional research aimed at replicating these results is warranted.

### *Implications for Research*

Further research should be conducted across all of the included outcomes of interests, populations, and camp settings. In addition, these research endeavors should aim to include larger sample sizes, more rigorous designs, and stronger, more consistent outcome measures. To begin, it is recommended that future literature reports all participant demographic information and camp intervention information. It is also recommended that future research endeavors aim to use experimental or quasi-experimental methodology and utilized random assignment whenever

feasible. A well-established camp outcomes measure has been developed by the ACA (ACA Youth Outcomes Battery; ACA, 2013) and it is recommended that this measure be utilized when applicable.

In conclusion, the meta-analysis provides supports for the value of summer camp interventions for children and adolescents with NDD across a variety of camp settings and styles. More robust research is needed to continue the research efforts summarized in this analysis and further delineate the specific mechanisms of camp interventions on camper outcomes. As these camps continue to grow in popularity, they become more widely available and more avenues for research open up.

# REFERENCES

References marked with an asterisk indicate studies included in the meta-analysis.

American Camp Association. (2019). ACA facts and trends. Retrieved from https://www.acacamps.org/press-room/aca-facts-trends

American Camp Association. (2013). Camp Youth Outcomes Battery [Measurement Instrument]. American Camp Association, Inc.

American Camp Association. (n.d.-a). *Who we are*. American Camp Association. https://www.acacamps.org/about/who-we-are

American Camp Association. (n.d.-b). *Find a camp*. American Camp Association. http://find.acacamps.org/search_results.php

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.

American Speech-Language-Hearing Association. (n.d.). *Intellectual disability*. Retrieved May 6, 2021 from https://www.asha.org/practice-portal/clinical-topics/intellectual-disability/#collapse_6

Autism Speaks. (n.d.). *Treatments for autism*. Retrieved May 6, 2021 from https://www.autismspeaks.org/treatments-autism

*Baker, B. L. (1973). Camp Freedom: Behavior modification for retarded children in a therapeutic camp setting. *American Journal of Orthopsychiatry*, *43*(3), 418-427. https://doi.org/10.1111/j.1939-0025.1973.tb00813.x

Barbaresi, W. J., Colligan, R. C., Weaver, A. L., Voigt, R. G., Killian, J. M., & Katusic, S. K. (2013). Mortality, ADHD, and psychosocial adversity in adults with childhood ADHD: A

prospective study. *Pediatrics*, *131*(4), 637-644. http://dx.doi.org/10.1542%2Fpeds.2021-2354

*Bateman, B. (1968). A pilot study of mentally retarded children attending summer day camp. *Mental Retardation, 6*(1), 39-44.

Biederman, J., Petty, C. R., Evans, M., Small, J., & Faraone, S. V. (2010a). How persistent is ADHD? A controlled 10-year follow-up study of boys with ADHD. *Psychiatry Research, 177*(3), 299–304. https://dx.doi.org/10.1016%2Fj.psychres.2009.12.010

Biederman, J., Petty, C. R., Monuteaux, M. C., Fried, R., Byrne, D., Mirto, T., Spencer, T., Wilens, T. E., & Faraone, S. V. (2010b). Adult psychiatric outcomes of girls with attention deficit hyperactivity disorder: 11-year follow-up in a longitudinal case-control study. *American Journal of Psychiatry, 167*(4), 409-417. https://doi.org/10.1176/appi.ajp.2009.09050736

Borenstein, M., Hedges, L., Higgins, J., & Rothstein, H. (2005). *Comprehensive Meta-Analysis Version 2. [Computer Software]*. Englewood, NJ: Biostat.

Breslau, J., Miller, E., Chung, W. J., & Schweitzer, J. B. (2011). Childhood and adolescent onset psychiatric disorders, substance use, and failure to graduate high school on time. *Journal of Psychiatric Research, 45*(3), 295-301. https://doi.org/10.1016/j.jpsychires.2010.06.014

Briery, B. G., & Rabian, B. (1999). Psychosocial changes associated with participation in a pediatric summer camp. *Journal of Pediatric Psychology*, *24*, 183-190. doi: 10.1093/jpepsy/24.2.183

*Burnes, A. J. & Hassol, L. (1966). A pilot study in evaluating camping experiences for the mentally retarded. *Mental Retardation*, *4*(4), 15-16.

Children and Adults with Attention-Deficit Hyperactivity Disorder. (n.d.). *Treatment of ADHD*.

Retrieved May 6, 2021 from https://chadd.org/about-adhd/treatment-of-adhd/

Cioni, G., Inguaggiato, E., & Sgandurra, G. (2016). Early intervention in neurodevelopmental disorders: Underlying neural mechanisms. *Developmental Medicine and Child Neurology*, *58*(S4), 61-66. doi: https://doi.org/10.1111/dmcn.13050

Cooper, H. (2017). *Research Synthesis and meta-analysis: A step-by-step approach*. Thousand Oaks, CA: Sage.

*Corbett, B. A., Swain, D. M., Coke, C., Simon, D., Newsom, C., Houchins-Juarez, N., Jenson, A., Wang, L., & Song, Y. (2014). Improvements in social deficits in autism spectrum disorders using a theatre-based, peer-mediated intervention. *Autism Research*, 7, 4-16. https://doi.org/10.1002/aur.1341

*Eaton, C. K., LaMotte, J., Gutierrez-Colina, A. M., Kardon, P., & Blount, R. L. (2015). Changes in socio-emotional and behavioral functioning after attending a camp for children with Tourette syndrome: A preliminary investigation. *Journal of Abnormal Child Psychology*, *44*(6), 1197-1203. https://doi.org/10.1007/s10802-015-0105-9

Frank, M., & Cavanna, A. E. (2013). Behavioral treatments for Tourette syndrome: An evidence-based review. *Behavioral Neurology*, *27*, 105-117. https://doi.org/10.3233/BEN-120309

*Gerber, W., Müller, G. G., Andrasik, F., Niederberger, U., Siniatchkin, M., Kowalski, J. T., Petermann, U., & Petermann, F. (2012). The impact of a multimodal summer camp training on neuropsychological functioning in children and adolescents with ADHD: An exploratory study. *Child Neuropsychology*, *18*(3), 242-255. https://doi.org/10.1080/09297049.2011.599115

*Goldhaber, S. B. (1991). Summer day treatment for children with attention-deficit hyperactivity disorder. *Hospital and Community Psychiatry*, *42*(4), 422-424.

https://doi.org/10.1176/ps.42.4.422

*Hayes, G. A. (1969). The integration of the mentally retarded and non-retarded in a day camping program: A demonstration project. *Mental Retardation, 7*(5), 14-16.

*Hanston, J., Wang, P. P., Grizenko-Vida, M., Ter-Stepanian, M., Harvey, W., Joober, R., & Grizenko, N. (2012). Effectiveness of a therapeutic summer camp for children with ADHD: Phase 1 clinical intervention trial. *Journal of Attention Disorders*, *16*(7), 610-617. https://doi.org/10.1177/1087054711416800

*Head, D. G. & Smith, D. (1975). Speech remediation of children involved in two different physical education programs. *Perceptual and Motor Skills*, *40*, 261-262. https://doi.org/10.2466/pms.1975.40.1.261

Hill, E., Ramsing, R., & Leary, A. (Eds.). (2021). Special issue – A critical exploration of evidence-based practice in organized camping, part I [Special issue]. *Journal of Outdoor Education, Recreation, and Leadership*, *13*(1).

Kuriyan, A. B., Pelham, W. E., Molina, B. S. G., Waschbusch, D. A., Gnagy, E. M., Sibley, M. H., Babinski, D. E., Walther, C., Cheong, J., Yu, J., & Kent, K. M. (January 2013). Young adult educational and vocational outcomes of children diagnosed with ADHD. *Journal of Abnormal Child Psychology*, *41*(1), 27–41. https://doi.org/10.1007/s10802-012-9658-z

Leary, A., Ramsing, R., & Hill, E. (Eds.). (2021). Special issue – A critical exploration of evidence-based practice in organized camping, part II [Special issue]. *Journal of Outdoor Education, Recreation, and Leadership*, *12*(2).

Lipsey, M., & Wilson, D. (2001). *Practical Meta-Analysis*. Thousand Oaks, CA: Sage.

*Marker, C., Weeks, M., & Kraegel, I. (2007). Integrating faith and treatment for children with

high functioning autism spectrum disorders. *Journal of Psychology and Christianity*, *26*(2), 112-121.

Maulik, P. K., Mascarenhas, M. N., Mathers, C. D., Dua, T., & Saxena, S. (2011). Prevalence of intellectual disability: A meta-analysis of population-based studies. *Research in Developmental Disabilities*, *32*(2), 419-436. https://doi.org/10.1016/j.ridd.2010.12.018

*Michalski, J. H., Mishna, F., Worthington, C., & Cummings, R. (2003). A multi-method impact evaluation of a therapeutic summer camp program. *Child and Adolescent Social Work Journal*, *20*(1), 53-76. https://doi.org/10.1023/A:1021467503588

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & The PRISMA Group (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine, 6*, 1-6. https://doi.org/10.1371/journal.pmed.1000097

Morris-Rosendahl, D. J. & Crocq, M. A. (2020). Neurodevelopmental disorders – The history and future of a diagnostic concept. *Dialogues in Clinical Neuroscience*, *22*(1), 65-72. https://doi.org/ 10.31887/DCNS.2020.22.1/macrocq.

*Mrug, S., Hoza, B., Pelham, W. E., Gnagy, E. M., & Greiner, A. R. (2007). Behavior and peer status in children with ADHD: Continuity and change. *Journal of Attention Disorders, 10*(4), 359-371. https://doi.org/10.1177/1087054706288117

*Nardella, M. T., Sulzbacher, S. I., & Worthington-Roberts, B. S. (1983). Activity levels of persons with Prader-Willi syndrome. *American Journal of Mental Deficiency, 87*(5), 498-505.

*O'Conner, B. C., Fabiano, G. A., Waschbusch, D. A., Belin, P. J., Gnagy, E. M., Pelham, W. E., Greiner, A. R., & Roemmich, J. N. (2013). Effects of a summer treatment program on functional sports outcomes in young children with ADHD. *Journal of Abnormal Child*

*Psychology*, *42*(6), 1005-1017. https://doi.org/10.1007/s10802-013-9830-0

Odar, C., Canter, K. S., & Roberts, M. C. (2013). Relationship between camp attendance and self-perceptions in children with chronic health conditions: A meta-analysis. *Journal of Pediatric Psychology*, *38*, 398-411. https://doi.org/10.1093/jpepsy/jss176

Owens, E., Cardoos, S. L, & Hinshaw, S. P. (2015). Developmental progression and gender differences among individuals with ADHD. In R. A. Barkley (Ed.), *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment, 4th ed.* (pp. 223-255). New York, NY: Guilford Press.

Reddihough, D., Leonard, H., Jacoby, P., Kim, R., Epstein, A., Murphy, N., Reid, S., Whitehouse, A., Williams, K., & Downs, J. (2021). Comorbidities and quality of life in children with intellectual disability. *Child: Care, Health, and Development*. https://doi.org/10.1111/cch.12873

Rosello, R., Martinez-Raga, J., Mira, A., Girela, B., & Cortese, S. (2021). Developmental outcomes in adolescence of children with autism spectrum disorder without intellectual disability: A systematic review of prospective studies. *Neuroscience and Biobehavioral Reviews*. https://doi.org/10.1016/j.neubiorev.2021.04.010

Simons, L. E., Gilleland, J., McDanel, A. H., Blount, R. L., & Campbell, R. (2008). Initial development of the Pediatric Camp Outcome Measure. *Children's Health Care*, *37*, 158-169. https://doi.org/10.1080/02739610802006593

*Schenkelberg, M. A., Rosenkranz, R. R., Milliken, G. A., & Dzewaltowki, D. A. (2015). *Social environmental influences on physical activity of children with autism spectrum disorders. Journal of Physical Activity and Health*, *12*(5), 636-641. https://doi.org/10.1123/jpah.2013-0312

Toft, G., Liu, C., Menon, J., Schendel, D., Loss, G., & Ehrenstein, V. (2021). Assessment of educational attainment and employment among individuals with autism spectrum disorder in Denmark. *JAMA Pediatrics*. https://doi.org/1001/jamapediatrics.2021.0124

*Walker, A. N., Barry, T. D., & Bader, S. H. (2010). Therapist and parent ratings of changes in adaptive social skills following a summer treatment camp for children with autism spectrum disorders: A preliminary study. *Child Youth Care Forum*, *39*, 305-322. https://doi.org/10.1007/s10566-010-9110-x

Wehmeyer, M. L. & Thompson, J. R. (2016). Intellectual disability and support needs: The unique support needs of people with intellectual disabilities. *Spotlight on Disability Newsletter*. Retrieved from https://www.apa.org/pi/disability/resources/publications/newsletter/2016/09/intellectual-disability-support

*Zemke, R., Knuth, S., & Chase, J. (2008). Changes in self-concepts of children with learning difficulties during a residential camp experience. *Occupational Therapy in Mental Health*, *4*(4), 1-12. https://doi.org/10.1300/j004v04n04_01

APPENDIX

Figure 1.

*PRISMA Flow Diagram*

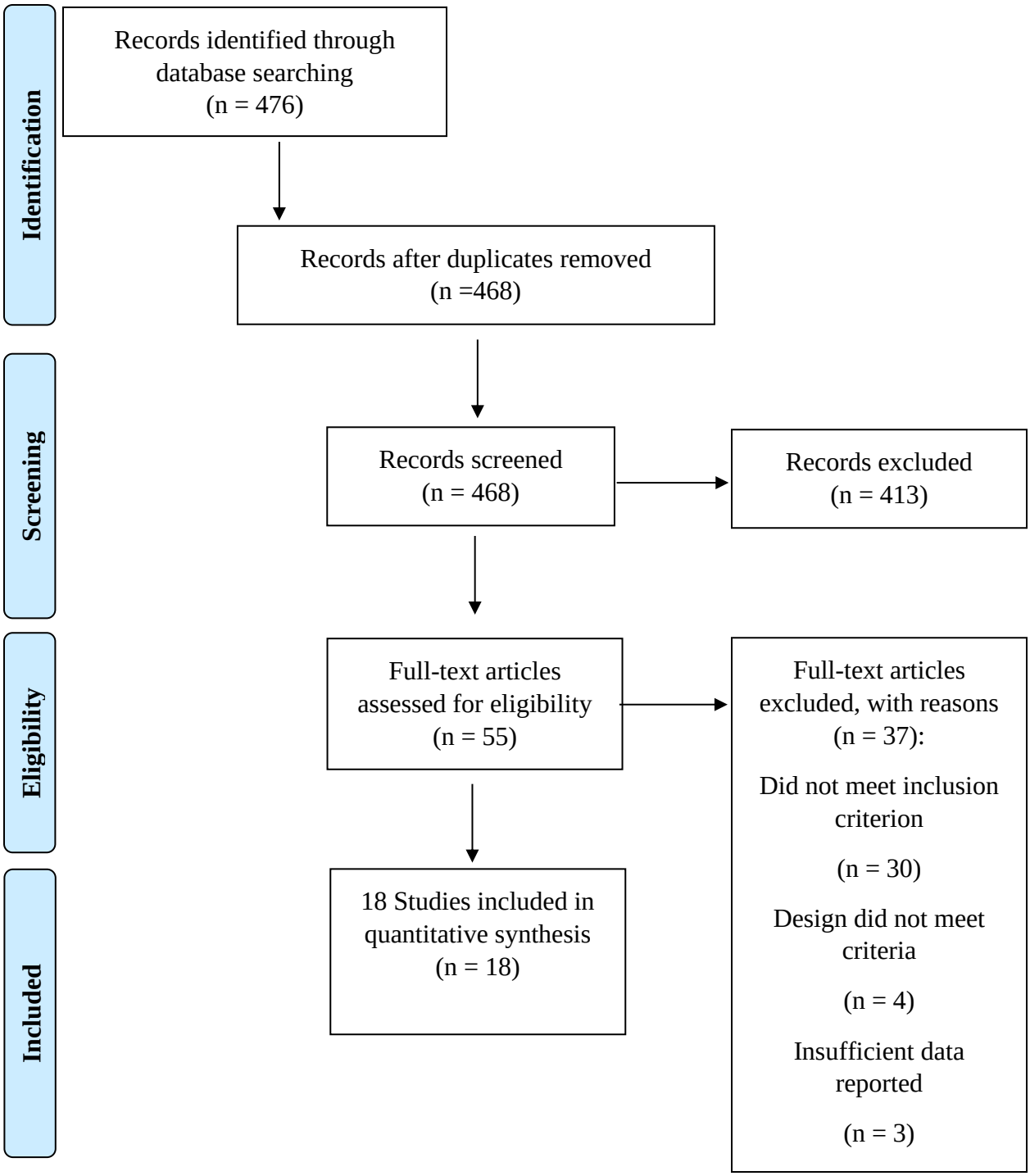
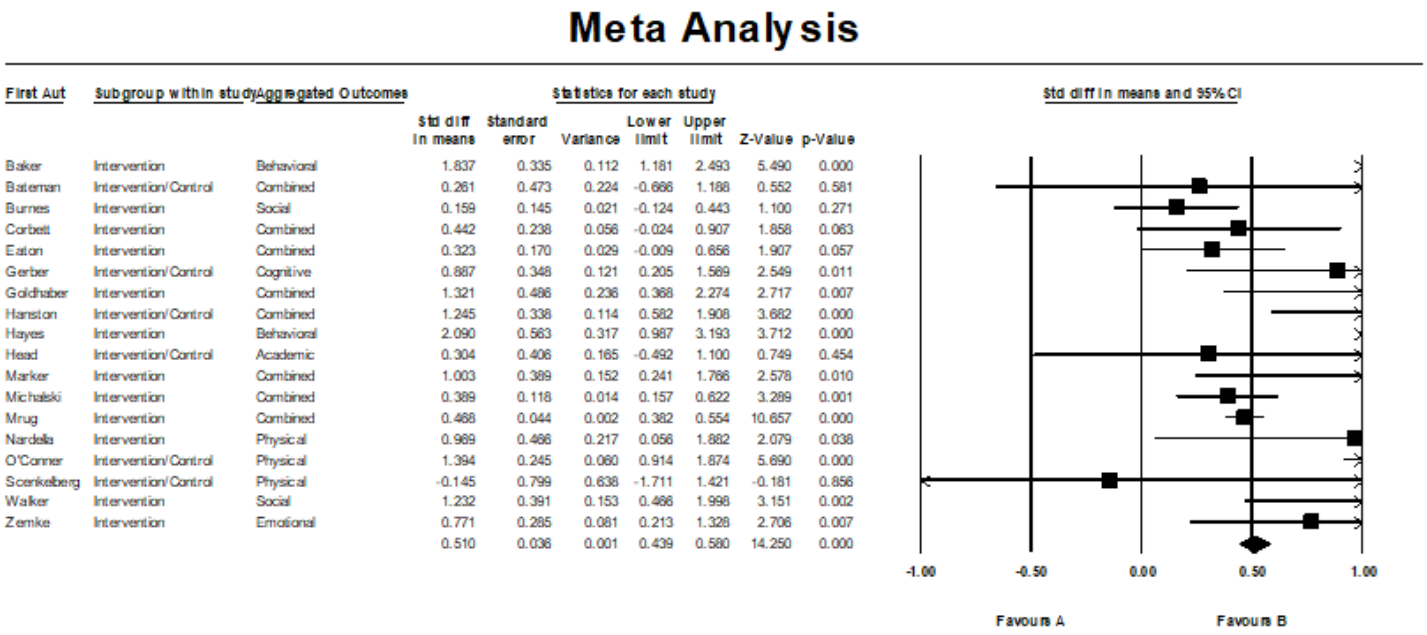


Figure 2.

*Fixed Effect Forest Plot*




**Meta Analysis**

Figure 3.

*Random Effect Forest Plot*

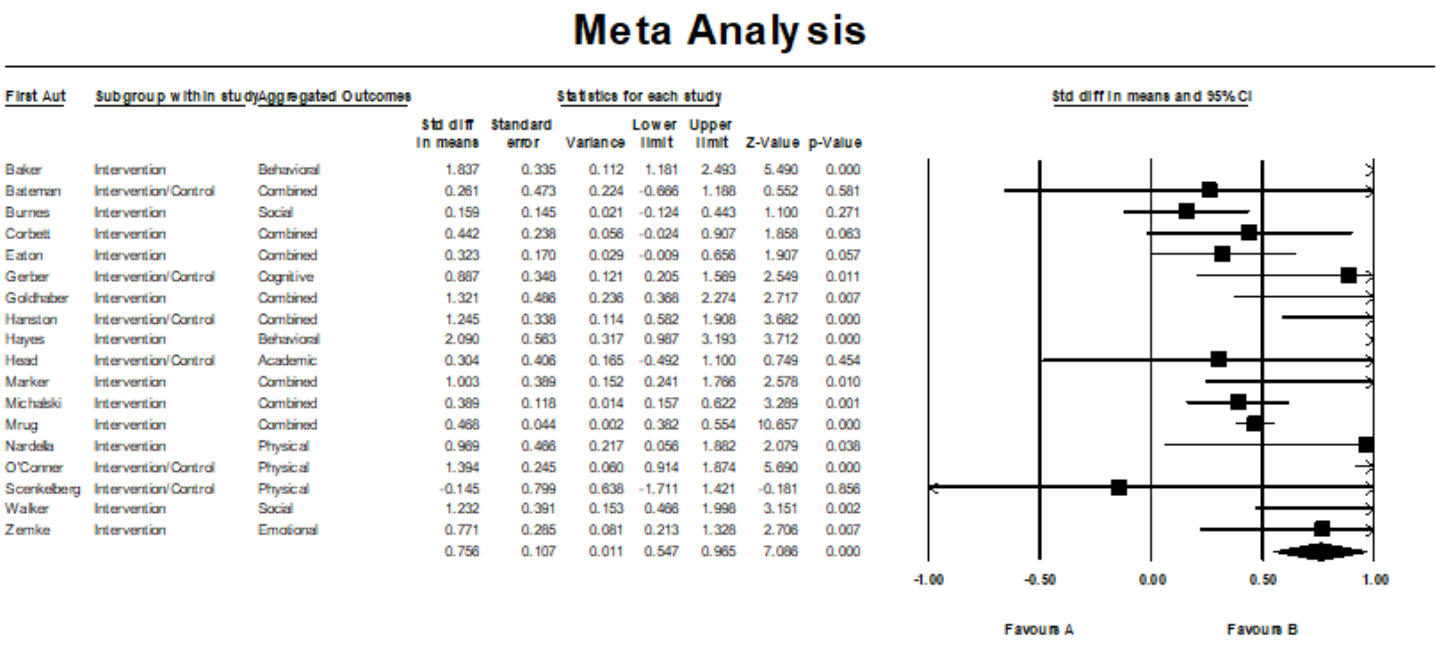


Figure 4.

*Funnel Plot of Standard Error by Effect Size*

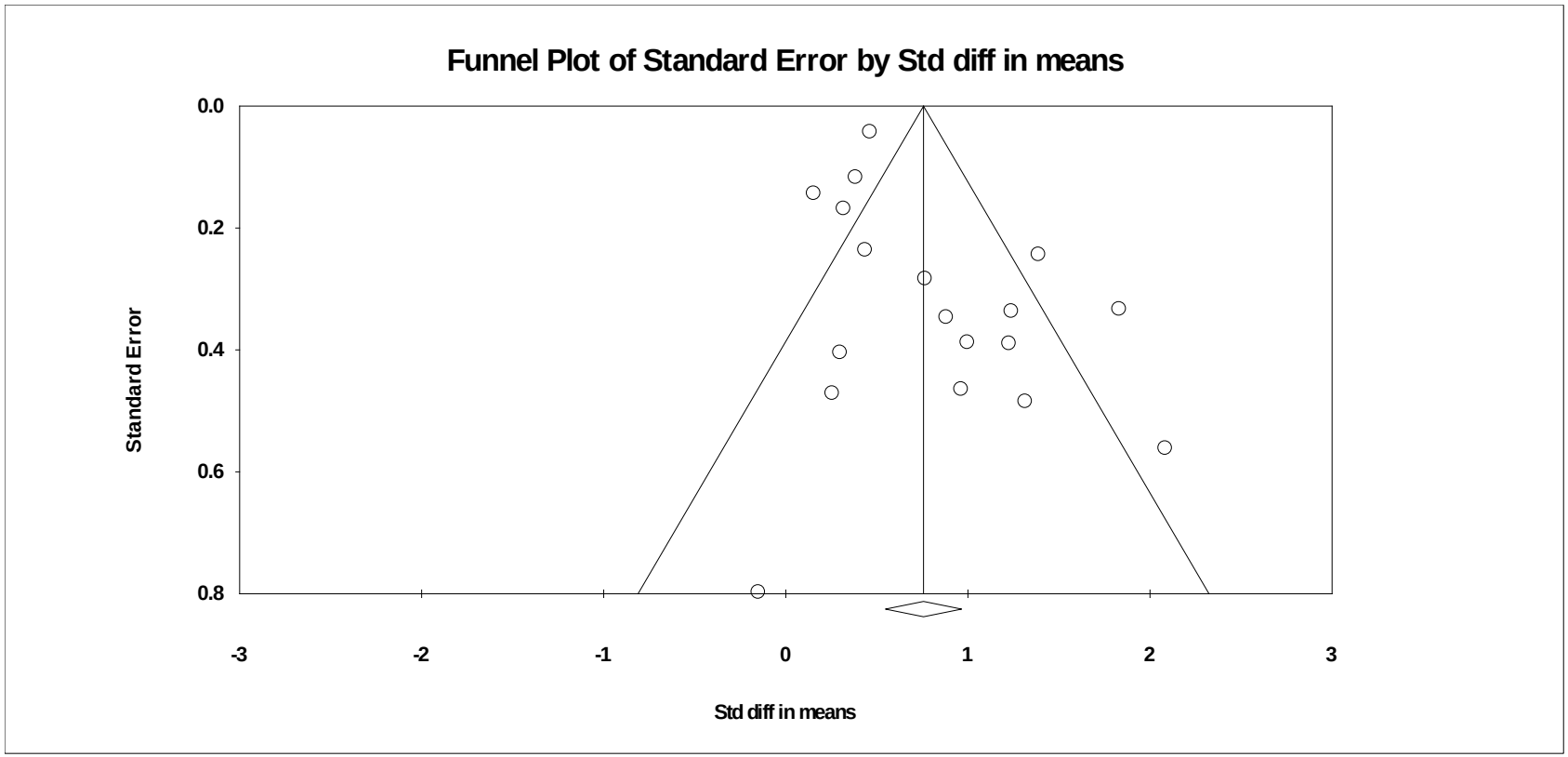


Table 1

*Results from Moderator Analysis*

| Moderator | *k* | Fixed Effect *d* | Fixed Effect CI | Fixed Effect *p* | Random Effect *d* | Random Effect CI | Random Effect *p* |
|---|---|---|---|---|---|---|---|
| | | | | *Outcomes* | | | |
| Social | 8 | 0.436 | 0.302, 0.570 | < .01 | 0.614 | 0.336, 0.892 | < .01 |
| Emotional | 6 | 0.471 | 0.306, 0.636 | < .01 | 0.616 | 0.289, 0.943 | < .01 |
| Behavioral | 8 | 0.632 | 0.548, 0.717 | < .01 | 0.853 | 0.536, 1.170 | < .01 |
| Cognitive | 7 | 0.364 | 0.288, 0.441 | < .01 | 0.736 | 0.414, 1.059 | < .01 |
| Academic | 2 | 0.982 | 0.466, 1.498 | < .01 | 0.908 | -0.238, 2.054 | .120 |
| Physical | 5 | 1.078 | 0.728, 1.427 | < .01 | 0.855 | 0.253, 1.457 | < .01 |
| | | | | *Population Diagnosis* | | | |
| ASD | 3 | 0.606 | 0.220, 0.992 | < .01 | 0.639 | -0.014, 1.292 | .055 |
| ID | 6 | 0.563 | 0.346, 0.781 | < .01 | 0.962 | 0.304, 1.621 | < .01 |
| ADHD | 6 | 0.526 | 0.444, 0.609 | < .01 | 1.008 | 0.552, 1.463 | < .01 |
| CD | 1 | 0.304 | -0.492, 1.100 | .454 | 0.304 | -0.492, 1.100 | .454 |
| MD | 1 | 0.323 | -0.009, 0.656 | .057 | 0.323 | -0.009, 0.656 | .057 |
| SLD | 3 | 0.437 | 0.264, 0.682 | < .01 | 0.543 | 0.229, 0.856 | < .01 |
| | | | | *Camp Integration Status* | | | |
| NISD | 10 | 0.517 | 0.442, 0.592 | < .01 | 0.829 | 0.555, 1.104 | < .01 |
| NIMD | 3 | 0.707 | 0.283, 1.130 | < .01 | 0.707 | 0.283, 1.130 | < .01 |
| ISD | 2 | 0.394 | -0.053, 0.840 | .084 | 0.394 | -0.053, 0.840 | .084 |
| IMD | 2 | 1.511 | 0.882, 2.141 | < .01 | 1.565 | 0.746, 2.385 | < .01 |
| | | | | *Camp Session Type* | | | |
| Day | 9 | 0.540 | 0.459, 0.621 | < .01 | 1.023 | 0.657, 1.389 | < .01 |
| Residential | 6 | 0.516 | 0.349, 0.683 | < .01 | 0.709 | 0.309, 1.110 | < .01 |

*Note*. *k* = Number of Articles; *d* = Cohen's *d*; CI = Confidence Interval; ID = Intellectual disability; ASD = autism spectrum disorder; MD = movement disorder; ADHD = Attention deficit/hyperactivity disorder; CD = Communication disorder; SLD = Specific learning disability; NISD = non-integrated, single diagnosis; NIMD = non-integrated, multi-diagnosis; ISD = integrated, single-diagnosis; IMD = integrated, multi-diagnosis.

Table 2

*Results from Meta-Regression Moderator Analyses*

| Moderator | *b* | *df* | Z | *p* |
|---|---|---|---|---|
| | | | *Participant Demographics* | |
| Age | 0.952 | 15 | 3.813 | < .01 |
| Gender | 1.510 | 10 | 1.523 | .128 |
| | | | *Camp Setting Characteristics* | |
| Camp Session Length | 0.592 | 14 | 5.635 | < .01 |

*Note*. *df* = degrees of freedom.

Table 3

*Study Demographics and Camp Characteristics*

| Author (Year) | Outcomes | *N* (% male) | Mean Age (years) | Study Design | Population | Length of Camp Session (weeks) | Camp Type | Camp Integration Status |
|---|---|---|---|---|---|---|---|---|
| Baker (1973) | BH | 40 (80) | 10.2 | PR, FI, CL | ID | -- | RC | NISD |
| Bateman (1968) | CG, PH | 120 (--) | 12.08 | PR, PO, CL | ID | 8 | DC | IMD |
| Burnes & Hassol (1966) | SO | 29 (--) | 11.5 | PR, PO | ID | -- | -- | -- |
| Corbett et al. (2014) | BH, CG, EM, SO | 11 (--) | 12.17 | PR, PO | ASD | 2 | DC | ISD |
| Eaton et al. (2016) | BH, EM, SO | 37 (76) | 12.32 | PR, PO | MD | 1 | RC | NISD |
| Gerber et al. (2012) | CG | 37 (86) | 11.27 | PR, PO, CL | ADHD | 2.5 | DC | NISD |
| Goldhaber (1991) | BH, CG, SO | 8 (--) | -- | PR, PO | ADHD | 8 | DC | NISD |
| Hanston et al. (2012) | AC, BH, CO, EM, SO | 48 (71) | 8.6 | PR, FI, CL | ADHD | 2 | DC | NISD |
| Hayes (1969) | BH | 30 (73) | 11.5 | MI | ID | 2 | DC | IMD |
| Head & Smith (1975) | AC | 28 (--) | 8.35 | PR, PO, CL | CD | 4 | RC | NISD |
| Marker et al. (2007) | BH, CG, EM, PH, SO | 16 (87) | 9.7 | PR, PO | ADHD | 1 | DC | NISD |
| Michalski et al. (2003) | EM, SO | 96 (--) | -- | PR, PO, FI | SLD | 3 | RC | NISD |
| Mrug et al. (2007) | BH, CG | 268 (--) | 8.8 | PR, MI | ADHD | 8 | DC | NISD |
| Nardella et al. (1983) | PH | 12 (83) | 15.29 | PR, MI, PO | ID, SLD | 2 | RC | NIMD |
| O'Conner et al. (2014) | PH | 98 (74) | 6.64 | PR, PO, CL | ADHD | 8 | DC | NISD |
| Schenkelberg et al. (2015) | PH | 12 (100) | 5.4 | MI, CL | ASD | -- | -- | ISD |
| Walker et al. (2010) | SO | 12 (92) | 4.42 | PR, PO | ASD | 4 | DC | IMD |
| Zemke et al. (1984) | EM | 16 (94) | 11 | PR, PO | ID, SLD | 2 | RC | NIMD |

*Note.* "—" = information not reported; BH = behavioral; CG = cognitive; PH = physical; SO = social; EM = emotional; AC = academic; PR = pre-intervention data collection; MI = mid-intervention data collection; PO = post-intervention data collection; FU = follow-up data collection; CL = control group; ID = intellectual disability; ASD = autism spectrum disorder; MD = movement disorder; ADHD = attention deficit/hyperactivity disorder; CD = communication disorder; SLD = specific learning disability; RC = residential camp setting; DC = day camp setting; NISD = non-integrated, single diagnosis; NIMD = non-integrated, multi-diagnosis; ISD = integrated, single-diagnosis; IMD = integrated, multi-diagnosis.