Behavioral Skill Training: A Single-Case Meta-Analysis

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Abstract

Behavioral skills training (BST), is a commonly used training procedure in Applied Behavior Analysis (ABA) that is designed to improve teaching new and desirable behaviors or skills. Research has demonstrated that BST is effective for training a variety of skills. The purpose of this meta-analysis was to examine the effectiveness of BST across age groups and training topics. Many of the published studies using BST are single-case designs. To evaluate these studies, a single-case meta-analysis was conducted which used percentage of non-overlapping data (PND), percentage of all overlapping data (PAND), and nonoverlap of all pairs (NAP). BST was found to be effective overall.

Keywords: Behavioral Skills Training, Meta-analysis, Single Case Design

Behavioral Skill Training: A Single- Case Meta-Analysis

Behavioral skill training (BST) is commonly used in the field of Applied Behavior

Analysis (ABA) and is empirically established to teach new skills to individuals (Rosales et al.,

2009). Miltenberger (2008) described BST as a procedure used to teach skills in a training

session. The goal of BST is for the learner to ultimately acquire skills and use them appropriately

in situations that occur outside of these training sessions (Miltenberger, 2008). BST has been

used to teach skills varying from lockdown drill procedures (Dickson & Vargo, 2017), correct

installation of child passenger safety restraints (Himle & Wright, 2014), to fire safety skills

(Houvouras & Harvey, 2014), computer skills (Sump et al., 2019), and safe tackling skills to

football players (Tai & Miltenberger, 2017). With the variety of skills that have been trained

with BST, the method has demonstrated effectiveness when training both children and adults.

Currently, BST is comprised of four steps: instruction, modeling, rehearsal, and feedback

(Miles & Wilder, 2009). Miltenberger (2008) provides directions and recommendations for each

step of BST. Instructions should be specific and broken down for the learner to understand the

concept. During modeling the trainer demonstrates the skill and the learner observers the skill.

For modeling to be effective, the learner must pay attention during the training session and

perform the behavior as demonstrated. Modeling can be done through various formats, including

in-vivo, video, or audiotape. Rehearsal allows the learner to demonstrate the skill to the trainer.

This is an important step as it allows the trainer to see if the learner implements the skill

correctly. After or during the completion of rehearsal, the trainer provides feedback to the

learner. Feedback involves both praise of what was done correctly, as well as correction of

errors.

BST has been used to increase appropriate behaviors. In a recent study, Quintero et al. (2019) evaluated the use of BST on youth who played soccer. In soccer, the heading technique is quite common for players to use, however it may result in head injuries. Quintero et al. (2019) used BST to teach a 14-step task for correct heading to prevent concussions. The training began by giving the player verbal instruction by reviewing each step of the task in detail with every player individually. Then, the correct heading technique was modeled by the trainer. After instruction and modeling, the player demonstrated their new skill, and the trainers provided feedback. The training was effective at teaching the new heading technique, and these skills were maintained over time (Quintero et al., 2019).

Caregivers, teachers, graduates, and undergraduates can also be taught new skills with BST. Dogan et al. (2017) evaluated the effectiveness of BST to teach parents to implement social-skill instruction with children diagnosed with autism spectrum disorders (ASD). BST was found to be effective for training parents to teach children social skills. Following parent BST training, children displayed an increase in the number of correctly performed steps with social skills. Follow-up results demonstrated that parents and children were able to display the same level of skills a month later.

BST has been demonstrated to be effective with young adults who were diagnosed with ASD. Sump et al. (2019) evaluated the effects of BST on the acquisition of basic computer skills by an adolescent diagnosed with ASD. Before implementing BST, the participant's level of accuracy was low ($M = 10\%$) and stable across all computer skills being tested. However, the level of accuracy rapidly increased across all computer skills being tested ($M = 98.6\%$) after BST was conducted. Furthermore, the participant's skills were able to be maintained and demonstrated over again for several sessions. The researchers suggested that BST was effective

for teaching basic computer skills that would be commonly used in an office job (Sump et al., 2019).

BST has been used directly with children with ASD. Thomas et al. (2016) evaluated the effects of BST on the acquisition of five target skateboarding skills with a child diagnosed with ASD. The child acquired the majority of the five skateboarding skills, as well as the ability to maintain these skills following training and in alternate settings. The study demonstrated moderate effectiveness of using BST in teaching sport skills to a child diagnosed with ASD.

There are a variety of skills that have been trained and demonstrated effectiveness through the use of BST. Examining the overall literature, researchers Kirkpatrick et al. (2019), Shafer & Andzik (2020), and Sun (2020) have conducted systematic reviews of the use of BST and its overall effectiveness with teachers, parents, and family caregivers of people with intellectual or developmental disabilities. Kirkpatrick et al. (2019) sought to summarize the current literature and inform practices going forward. Researchers collected and reviewed the studies, which yielded 12 studies meeting inclusion criteria, with 15 experiments. The collected studies were gathered from six peer-reviewed journals, dating between the years 2004 and 2017. The systematic review showed that BST literature with teachers is limited. The most common skill BST was used for was discrete trial training (DTT), and BST was used most often with special education teachers working with individuals with disabilities. Although BST has demonstrated its effectiveness with individuals with disabilities, the lack of research with general education teachers made it difficult for researchers to support the notion that BST is effective with general education teachers. No effect size was calculated in this review.

Schaefer and Andzik (2020) sought to evaluate BST when training parents to intervene with their children. The inclusion criteria included studies published in English in a peer-

reviewed journal before January 1, 2019, and included all components of BST. They also

included studies that included parents of children with disabilities and without disabilities. The

inclusion criteria yielded 19 articles that included 20 separate single-subject studies, dating from

1989 to 2019. BST was a successful method to train parents to implement evidence-based

practices with their children. No effect size was calculated in this review; however, it was

suggested that future research may want to calculate the effect sizes of BST.

Sun (2020) also examined the literature on BST for family caregivers of people with

intellectual or developmental disabilities. Sun (2020) did not have a timeframe for the systematic

review, which yielded a total of 17 articles. BST was generally found to be effective, as family

caregivers effectively administered behavioral techniques (e.g., incidental teaching and discrete

trial instruction) to their children with intellectual or developmental in numerous studies and the

children often acquired skills as a result.

BST has been shown to be effective in multiple studies in which people are trained to

teach skills to others, as well as directly teaching a skill to an individual. The current study

sought to examine recent literature looking at the effectiveness of BST both training others to

teach a skill and directly teaching a skill to an individual, across all populations. A meta-analysis

looking at the overall effectiveness of BST in recent years would help solidify BST as the gold

standard for training in ABA. This would also allow practitioners to identify with which ages and

target behaviors BST is most effective. The purpose of this meta-analysis is to expand

Kirkpatrick et al. (2019) study to include recent years, as well as effect size estimates.

Methodology

One researcher conducted a search for articles using the authors' university library

database, EBSCOhost, PsychInfo, and PsychArticles. The search was refined by limiting the

article search to scholarly peer-reviewed journals. The keywords used in the search were "behavioral skill training," and "BST." A title search was conducted while reviewing the current literature on BST. The search was limited by constricting the time frame from 2010 to the present time (Pigott & Polanin, 2020). A total of 117 articles were retrieved. Of the articles, 87% utilized single-case design (SCD). To analyze the data we eliminated any article that did not utilize SCD. Once articles were identified as using or referring to BST, a manual ancestral search through references was conducted to gather additional studies that did not emerge from the original database search. The final search date for the study was 2020, January 10. A second researcher conducted an interrater-observer agreement (IOA) when searching the above databases with the keywords listed. There was 100% agreement on articles found when the inclusion criteria were applied.

Inclusion Criteria

Inclusion in this meta-analysis was based on six criteria. First, the author(s) had to state that the intervention used was BST or described BST procedures. We adopted Miltenberger's (2008) definition for BST which required the use of four procedures: instruction, modeling, rehearsal, and feedback. Second, the articles must have used a SCD. Third, the articles must have been in the English language. Fourth, the study sources that were considered for review were only peer-reviewed journal articles. Fifth, the timeframe for the articles must have been from 2010 to the present. We followed Busse et al.'s (1995) recommendation of a 10-year timeframe for the current meta-analysis to ensure that methods are still effective at present time. Last, the study must have included a clear time-series graph of the results so that visual analysis could be used in the meta-analysis. These inclusion criteria yielded 20 articles dating from 2010-2019.

Sample and design, target behavior, who learned the new skills, intervention, and treatment integrity of the studies are reported in *Table 1*.

Exclusion Criteria

The exclusion of articles was based on two criteria. For our purposes, several articles were gathered solely based on being a SCD that mentioned the use of BST. However, our focus was primarily on multiple baseline SCDs; therefore, if the article mentioned BST, but was not a multiple baseline design (e.g., multiple-probe design or an ABAB design) it was removed before analyses. Multiple probe or ABAB designs were excluded due to the difficulty of calculating the percentage of non-overlapping data (PND; Beretvas & Chung, 2008). The second criterion for exclusion of an article was if the article did not contain clear graphs allowing for visual analysis. *Table 1* shows the articles that were not included in our analyses, as well as the reason for exclusion.

Meta-Analytic Method

There are various methods to evaluate SCD studies in a meta-analysis. Wolery and colleagues (2010) reviewed analytic methods to evaluate SCD studies, comparing PND and PDO. Maslow and Solanas (2017) reviewed the analytic methods to evaluate SCD studies. In the current study, three nonoverlap effect sizes were calculated to examine the effectiveness of BST: percentage of nonoverlapping data (PND), percentage of all overlapping data (PAND), and nonoverlap of all pairs (NAP).

PND (Scruggs & Mastropieri, 1998) was used to estimate effect sizes. PND involves calculating the percentage of treatment data above or below baseline data, depending on the desired direction of the behavior. To calculate PND a straight line, parallel to the abscissa, is drawn from the highest or lowest baseline data point, depending on the desired direction of the

behavior (e.g., increase or decrease). The percentage of points above or below the line in the treatment phase is calculated. According to Scruggs and Mastropieri (1998), a PND of 80% and above indicates an effective intervention. A PND of 79%-60% is indicative of a moderately effective intervention. PNDs below 59% indicate ineffective treatments.

Riley-Tilman and Burns (2009) stated that the strengths of PND are that the method is easy to understand, applicable to any single-case design, easy to compute, and the method is consistent with visual analysis. Other strengths of this method are that it is unaffected by problems of nonlinearity and heterogeneity of variance (Busse et al., 1995). SCDs often only provide data through a graph, without providing a table with the actual data points. Synthesis can only be done by PND or visual analysis if this is the case (Scruggs & Mastropieri, 1998).

Scruggs and Mastropieri (2012) revisited the use of PND to synthesize SCD and stated PND has been used for the past 25 years and continues to be useful. The authors looked at other methods of synthesizing SCDs, such as using a visual analysis rating scale and regression-based effect sizes. The authors stated a valid visual analysis rating scale has not been created and regression-based effect size is difficult to calculate when raw data are not provided, which is common in single-case literature. Scruggs and Mastropieri (2012) stated that PND continues to be the most widely used method of synthesizing single case design studies.

White (1987) outlined several weaknesses of the PND method. PND is unaffected by small trend changes. For example, if a trend in baseline exists, a trend in the treatment may be carried over from the baseline and disregarded by PND. An outlier in baseline could also affect PND and create a weak score that may be an inaccurate representation of treatment effectiveness. Another weakness is that PND is overly sensitive to small changes in baseline and treatment. If all treatment scores change by one point from the highest or lowest baseline point, the PND

would be 100%, which would translate to a very effective intervention when a one-point change from baseline to intervention is rarely a very effective intervention (White, 1987). These weaknesses can be partially addressed by eliminating ABAB designs. To address some of the weaknesses of PND both mean and median effect sizes were calculated.

PAND (Parker et al., 2007) is described as the percentage of data remaining after removing the fewest data points that would eliminate all overlap. To calculate PAND a line is drawn above the highest baseline point. The data points in the treatment phase which overlap with the baseline are divided by the total data point and the percentage is derived. There are potential advantages of PAND over the PND approach. First, PAND utilizes the data from all phases. Similar to PND, calculating PAND is simple, and PAND can be calculated from a time-series graph. PAND shares two limitations of PND: outliers can affect PAND, and when there is no overlap between phases the PAND is 100% regardless of the distance between the baseline points and the treatment points (Parker et al., 2007).

NAP (Parker & Vannest, 2008) is the percentage of pairwise comparison across phases A and B. Each treatment data point is given a value for each baseline data point: 0 (indicating the treatment data point is below the baseline point), 0.5 (indicating the treatment point is level with the baseline point), or 1 (indicating the treatment point is above the baseline point). The values are added and divided by the total amount of baseline points. Parker and Vannest (2008) outlined the advantages of NAP. NAP may be better able to discriminate results from a large group of studies. Other advantages are that NAP has stronger validation in the literature and stronger validation when compared to visual analysis, and NAP has been shown to exhibit better score precision as indicated by smaller confidence intervals. NAP shares one of the limitations of

PND; if all treatment points are above baseline, an intervention receives a NAP effect size of 100% regardless of the distance between baseline and treatment.

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Results

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A median and mean PND, PAND, NAP were calculated for each study (see Table 2). PND is reported for each comparison below, while PAND and NAP can be found in Table 2. The mean and median non-overlapping effect sizes provided slightly different results and are discussed separately. When combining nonoverlapping techniques, the median has been suggested as the preferred measure of central tendency for data synthesis due to the potentially large number of outliers in the data (Parker et al., 2011). The mean non-overlapping comparison is considered more conservative but is more affected by outliers. Both were calculated in this study and compared. No large differences were found, indicating either would be acceptable in this case.

Median Effect Size Results

The individual median PND data were combined into an overall median, which resulted in the following outcomes: 20 studies evidenced an overall median PND of 100%. According to these data, the nonoverlapping technique, specifically PND, indicates that BST is an effective intervention for both adults and children, overall. Furthermore, PAND and NAP both demonstrated an overall median of 100% further supporting the effectiveness of BST. Of the 20 studies, 18 evidenced median PNDs over 80%. None of the studies evidenced moderate median PND outcomes of 60-79%. Two studies evidenced weak median PND outcomes of 0% and 56%.

To evaluate the effectiveness of BST on different age groups, the median nonoverlapping effect size for each subject was calculated and then disaggregated into age groups. For children ages six and under ($n = 29$), the median PND was 100%, indicating an effective outcome. For

children ages seven to eight ($n = 6$), the median PND was 100%. All nonoverlapping effect sizes indicated an effective outcome. For children ages 10 to 17 ($n = 39$), the median PND was 100%, indicating effective outcomes. For adults ages 18 and above ($n = 36$), the median PND was 100%, indicating effective outcomes.

Six studies identified the participants as males. The target behaviors focused on were conversational skills, athletic skills, fire safety, and computer skills. The overall median PND was 100%. These median nonoverlapping effect sizes indicated effective outcomes for males. Two studies identified participants as female. The target behaviors were correct heading and card counting accuracy. The overall median PND was 100%. These median nonoverlapping effect sizes indicated effective outcomes for females.

Two studies were conducted on peer-initiated BST. These two studies included teaching skills for implementing DTT correctly and conversational skills for students diagnosed with a learning disability. The overall median PND was 100%. These median nonoverlapping effect sizes indicated effective outcomes. Of the studies that involved school staff, researcher, or parent implementing BST, the median PND for 14 studies was 100%, indicating effective outcomes.

Four of the included studies measured initiating and maintaining social interactions as the target behaviors. These studies included teaching skills such as appropriate interview behaviors and social skills to children diagnosed with autism,which resulted in a median PND of 100%, indicating effective outcomes. Three studies included BST training for athletic skills. These target skills included soccer abilities, correct heading, and skateboarding skills. The median PND for these studies was 100% which indicates effective outcomes with using BST for athletic skill improvement. Four studies examined implementing BST for safety skills for children. The target skills included lockdown drill responses, fire safety, abduction prevention, and

avoiding/reporting unsafe packages. The median PND for these studies was 100%, indicating strong outcomes for this target behavior. No other target behaviors could be aggregated for separate analysis.

Mean Effect Size Results

To compare mean effect sizes, means were calculated on the same studies, age groups, peer versus staff and parent initiating, and target behaviors. Twenty studies resulted in a mean PND of 89.46%. These results indicate that using BST for intervention produces effective outcomes. Furthermore, PAND and NAP demonstrated strong mean effects, 89.80% and 95.17%, supporting that BST produces effective outcomes.

Mean effect sizes were disaggregated according to participants' ages: BST intervention outcomes for ages six and under ($n = 29$) the results were a mean PND of 96.92%, indicating effective outcomes. For the ages of seven to eight ($n = 6$), the mean PND was 100%, indicating effective outcomes. For ages nine through 17 ($n = 39$), the mean PND was 93.53%, indicating a strong effect. Finally, for ages 18 and above ($n = 36$), the mean PND was 83.45%, indicating a strong effect.

Of the studies that identified participants as male the overall mean PND was 98.20%. These mean nonoverlapping effect sizes indicated effective outcomes for males. In the studies that identified participants as female the overall mean PND was 100%. These mean nonoverlapping effect sizes indicated effective outcomes for females.

For studies that used typical peers to implement BST ($n = 4$), the mean PND was 97.91%, indicating effective outcomes. For studies that used staff and parents to implement BST ($n = 52$), the mean PND was 88.96%. These mean effect sizes indicate effective outcomes.

The same target behaviors were examined with the mean effect sizes. Four studies intervened on maintaining interactions. For these studies, the mean PND was 78.04%. These results indicate moderate to effective outcomes. Three studies used BST for training athletic skills. The mean PND for these studies was 98.40%, which indicates strong effects. Four studies examined implementing BST for safety skills for children. The target skills included lockdown drill responses, fire safety, abduction prevention, and avoiding/reporting unsafe packages. The mean PND for these studies was 92.52%, indicating strong outcomes for this target behavior. No other target behaviors could be aggregated for separate analysis.

Demographics

Nine of these articles related to children with exceptionalities, which included physical disability, learning disability, and ASD. More specifically, seven of those articles studied children who were diagnosed with ASD, one article studied physical disabilities, and the other learning disabilities with BST. Furthermore, eleven of the articles had caregivers, teachers or college students acquire the skill, either for themselves or to teach to another person. The remaining nine articles included in the analysis had children or adolescents acquiring the skills being taught. Of these twenty articles, target behaviors varied between studies. Examples of target behaviors were conversational skills, adduction prevention skills, card counting accuracy, child passenger safety restraint installation, appropriate interview behavior and answers, fire safety skills, accuracy of reporting suspicious packages, and computer skills. In total, there were 125 participants. All but two studies provided descriptive data on the ages and gender of participants. Of those articles that reported ages, the range of reported participants was three through 59.

Discussion and Conclusion

The purpose of this meta-analysis was to determine the effectiveness of BST using PND, PAND, and NAP effect sizes, and extrapolate any variables that may change the effectiveness of BST. Overall, this meta-analysis found BST to be effective. The median and mean effect sizes indicate that the optimal age to intervene with BST may be under age 18. Median effect size results indicate that initiating BST with peers or parents and staff for BST has the same effectiveness, whereas the mean effect size results indicate that initiating BST with peers may be more effective than intervening with parents and staff. Finally, the median and mean effect size results indicated that BST was effective in improving social interactions.

Utilizing the median and the mean PND allowed this meta-analysis to compare these meta-analytic methods when aggregating results. Using the mean for combined nonoverlapping effect sizes resulted in a more conservative estimate of effectiveness. However, if there are outliers it is recommended the median PND is used. Both were calculated and few differences were found in the PND effect size results. Furthermore, researchers calculated the overall PAND and NAP effect sizes and results demonstrated no significant difference, which supports that BST as an intervention produces effective outcomes overall.

One limitation of this meta-analysis is the sole use of nonoverlapping effect sizes to evaluate the studies. Limitations of nonoverlapping effect sizes were discussed previously and include the potential to be insensitive to trends, overly sensitive to small changes, and to not represent true effect sizes when outliers are present. Further, nonoverlapping techniques can create false positives and false negatives, resulting in a skewed view of the effectiveness of interventions. Other major limitations are the small number of studies, and the limited subject pools; females and students from diverse ethnic groups are underrepresented. The implications of

this results in a lack of generalizability, therefore it is encouraged future researchers seek more inclusive samples. Given these limitations, the results of this meta-analysis must be interpreted with caution.

BST is described as an empirically validated method (Miltenberger, 2008). The results from this meta-analysis provide support for the effectiveness of BST across age ranges and administrators of the direct intervention. Results of this meta-analysis indicate BST is effective at teaching several behaviors, ranging from functional skills to social skills to implementation of an intervention. Although the literature suggests BST is effective with several behaviors, the small number of studies included in this meta-analysis prevent aggregated effect sizes or comparisons between effect sizes for specific behaviors taught using BST. To better answer questions about with whom and for what behaviors BST is effective, additional research needs to be conducted to evaluate the effectiveness of BST with diverse populations and on aggregated age groups and target behaviors.

Conflict of Interest

These authors declare that they has no conflict of interest.

Ethical Approval

This article does not contain any studies with human or animal participants performed by the authors.

References

Aherne, C. M., & Beaulieu, L. (2018). Assessing long-term maintenance of staff performance following behavior skills training in a home-based setting. *Behavioral Interventions, 34*, 79-88. https://doi.org/10.1002/bin.1642

Beaulieu, L., Hanley, G. P., & Santiago, J. L. (2014). Improving the conversational skills of a college student with peer-mediated behavioral skills training. *Analysis Verbal Behavior, 30*, 48-53. https://doi.org/10.1007/s40616-013-0001-8

Beretvas, S. N., & Chung, H. (2008). *A review of meta-analyses of single-subject experimental designs: Methodological issues and practice. Evidence-Based Communication Assessment and Intervention, 2(3), 129–141.*

Busse, R. T., Kratochwill, T. R., & Elliott, S. N. (1995). Meta-analysis for single case consultation outcomes: Application to research and practice. *Journal of School Psychology, 33*, 269-285. https://doi.org/10.1521/scpq.19.1.1.29406

Carr, M. E. (2015). A sensitivity analysis of three nonparametric treatment effect scores for single-case research for participants with Autism. *Review Journal of Autism and Developmental Disorders, 2*, 67-78. https://doi.org/10.1007/s40489-014-0037-2

Chambers, C., & Radley, K. C. (2019). Training soccer skills to adolescents with autism spectrum disorder via peer-mediated behavioral skills training. *Behavior Analysis in Practice*. https://doi.org/10.1007/s40617-019-00381-2

Cooper, H., Hedges, L. V., & Valentine J. C. (2009). *The handbook of research synthesis and meta-analysis* (2nd ed.). Russell Sage Foundation.

Davenport, C. A., Alber-Morgan, S. R., & Konrad, M. (2019). Effects of behavioral skills training on teacher implementation of a reading racetrack intervention. *Education and Treatment of Children, 42*(3), 385-408. https://doi.org/10.1353/etc.2019.0018

Dickson, M. J., & Vargo, K. K. (2017). Training kindergarten students lockdown drill procedures using behavioral skills training. *Journal of Applied Behavior Analysis, 50*(2), 407-412. https://doi.org/10.1002/jaba.369

Dogan, R. K., King, M. l., Fischetti, A. T., Lake, C. M., Mathews, T. L., & Warzak, W. J. (2017). Parent-implemented behavioral skills training of social skills. *Journal of Applied Behavior Analysis, 50*(4), 805-818. https://doi.org/10.1002/jaba.411

Erath, T. G., DiGennaro Reed, F. D., Sundermeyer, H. W., Brand, D., Novak, M. D., & Harbison, M. J. (2019). Enhancing the training integrity of human service staff using pyramidal behavioral skills training. *Journal of Applied Behavior Analysis,* 1-16. https://doi.org/10.1002/jaba.608

Gianoumis, S., & Seiverling, L. (2012). The effects of behavior skills training on correct teacher implementation of natural language paradigm teaching skills and child behavior. *Behavioral Interventions, 27*(2), 1-18. https://doi.org/10.1002/bin.1334

Hassan, M., Simpson, A., Danaher, K., Haesen, J., Makela, T., & Thomson, K. (2018). An evaluation of behavioral skills training for teaching caregivers how to support social skills development in their child with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 48,* 1957-1970. https://doi.org/10.1007/s10803-017-3455-z

Himle, M. B., & Wright, K. A. (2014). Behavioral skills training to improve installation and use of child passenger safety restraints. *Journal of Applied Behavior Analysis, 47*(3), 549-559. https://doi.org/10.1002/jaba.143

Houvouras IV, A. J., & Harvey, M. T. (2014). Establishing fire safety skills using behavioral

skills training. *Journal of Applied Behavior Analysis, 47*(2), 420-424.

https://doi.org/10.1002/jaba.113

Hussan, M., Thomson, K. M., Khan, M., Riosa, P. B., & Weiss, J. A. (2017). Behavioral skills

training for graduate students providing cognitive behavior therapy to children with

autism spectrum disorder. *Behavior Analysis Research and Practice,* 17(2), 155-165.

https://doi.org/10.1037/bar0000078

Krikpatrick, M., Akers, J. & Rivera, G. (2019). Use of behavioral skills training with teachers: a

systematic review. *Journal of Behavioral Education,* 28, 344-361.

https://doi.org/10.1007/s10864-019-09322-z

Ledbetter-Cho, K., Lang, R., Davenport, K., Moore, M., Lee, A., O'Reily, M., Watkins, L., &

Falcomata, T. (2016). Behavioral skills training to improve the abduction-prevention

skills of children with autism. *Behavioral Analysis in Practice, 9*, 266-270.

http://10.1007/s40617-016-0128-x

Manolov, R., & Solanas, A. (2017). *Analytical Options for Single-Case Experimental Designs:*

Review and Application to Brain Impairment. Brain Impairment, 19(01), 18–

32. Doi:10.1017/brimp.2017.17

May, M. E., Shayter, A. M., Schmick, A., Barron, B., Doherty, M., & Johnson, M. (2018).

Teaching preschool children to report suspicious packages to adults. *Journal of Applied*

Behavior Analysis, 51(3), 571-589. https://doi.org/10.1002/jaba.478

Miles, N. I., & Wilder, D. A. (2009). The effects of behavioral skills training on caregiver

implementation of guided compliance. *Journal of Applied Behavior Analysis*, *42*(2), 405-

410. https://doi.org/10.1901/jaba.2009.42-405

Miltenberger, R. G. (2008). *Behavior Modification: Principle and Procedures*. Wadsworth

  Publishing.

Nabeyama, B., & Sturmey, P. (2010). Using behavioral skills training to promote safe and

  correct staff guarding and ambulation distance of students with multiple physical

  disabilities. *Journal of Applied Behavior Analysis, 43*(2), 341-345.

  https://doi.org/10.1901/jaba.2010.43-341

Parker, R. I., Hagan-Burke, S., & Vannest, K. (2007). Percentage of All Non-Overlapping Data

  (PAND): An alternative to PND. *The Journal of Special Education, 40*(4), 194-204.

  https://doi.org/10.1177/00224669070400040101

Parker, R.I., & Vannest, K.J. (2008). An improved effect size for single-case research:

  nonoverlap of all pairs. *Behavior Therapy, 40,* 95-105.

Parker, R. I., Vannest, K. J., & Davis, J. L. (2011). Effects size in single-case research: A review

  of nine nonoverlap techniques. *Behavior Modification, 35*(4), 303-322.

  https://doi.org/10.1177/0145445511399147

Pigott, T. D., & Polanin, J. R. (2020). Methodological Guidance Paper: High-Quality Meta-

  Analysis in Systematic Review. *Review of Educational*

  Research, *90*(1), https://doi.org/10.3102/0034654319877153

Quintero, L. M., Moore, J. W., Yeager, M. G., Rowsey, K., Olmi, D. J., Britton-Slater, J.,

  Harper, M. L., & Zezenski, L. E. (2019). Reducing risk of head injury in youth soccer:

  An extension of behavior skills training for heading. *Journal of Applied Behavior*

  Analysis, 1-12. https://doi.org/10.1002/jaba.557

Riley-Tilman, T. C., & Burns, M. K. (2009). *Evaluating educational interventions: Single-case*

  design for measuring response to intervention. The Guilford Press.

Rosales, R., Stone, K., & Rehfeldt, R. A. (2009). The effects of behavioral skills training on

    implementation of the picture exchange communication system. *Journal of Applied*

    Behavior Analysis, 42(3), 541-549. https://doi.org/10.1901/jaba.2009.42-541.

Schafer, J. M., & Andzik, N. R. (2020). Evaluating behavioral skills training as an evidence-

    based practice when training parents to intervene with their children. *Behavior*

    Modification, 1-24. https://doi.org/10.1177/0145445520923996

Scruggs, T. E., & Mastropieri, M. A. (1988). Synthesizing single subject research: Issues and

    application. *Behavior Modification, 22*, 221-242.

Scruggs, T. E., & Mastropieri, M. A. (2012). PND at 25 Past, present, and future trends in

    summarizing single-subject research. *Remedial and Special Education,34*(1), 9-19.

    https://doi.org/10.1177/0741932512440730

Speelman. R. C., Whiting, S. W., & Dixon, M. R. (2015). Using behavioral skills training and

    video rehearsal to teach blackjack skills. *Journal of Applied Behavior Analysis, 48*(3),

    632-64. https://doi.org/10.1002/jaba.225

Stocco, C. S., Thompson, R. H., Hart, J. M., & Soriano, H. L. (2017). Improving the interview

    skills of college students using behavioral skills training. *Journal of Applied Behavior*

    Analysis, 50(3), 495-510. https://doi.org/10.1002/jaba.385

Sump, L. A., Mottau, B. C., & LeBlanc, L. A. (2019). Evaluating behavioral skills training to

    teach basic computer skills to a young adult with autism. *Behavior Analysis in Practice,*

    12, 331-334. https://doi.org/10.1007/s40617-018-00295-5

Sun, X. (2020). Behavior skills training for family caregivers of people with intellectual

    disabilities or developmental disabilities: A systematic review of literature. *International*

Journal of Developmental Disabilities, 0(0), 1-27.

https://doi.org/10.1080/20473869.2020.1793650

Tai, S. S. M. & Miltenberger, R. G. (2017). Evaluation behavioral skills training to teach safe

tackling skills to youth football players. *Journal of Applied Analysis, 50*, 849-855.

Thomas, B. R., Lafasakis, M., & Spector, V. (2016). Brief report: Using behavioral skills

training to teach skateboarding skills to a child with autism spectrum disorder. *Journal of

Autism Developmental Disorders, 46*, 3824-3829. https://doi.org/10.1007/s10803-016-

2900-8

White, O. R. (1987). Some comments concerning "The quantitative synthesis of single-subject

research." *Remedial and Special Education, 8*, 34-39.

https://doi.org/10.1177/074193258700800207

Wolery, M., Busick, M., Reichow, B., & Barton, E. E. (2010). Comparison of Overlap Methods

for Quantitatively Synthesizing Single-Subject Data. *The Journal of Special

Education*, *44*(1), 18–28. https://doi.org/10.1177/0022466908328009