
Julia A. Snethen, PhD, RN • Marion E. Broome, PhD, RN • Pamela Treisman, BS, RN • Erica Castro, AD • Sheryl T. Kelber, MS

ABSTRACT

Background: Investigators have implemented a variety of strategies for managing and treating childhood overweight and obesity over the past decade, yet the high prevalence of childhood overweight or obesity remains. The aim of this meta-analysis was to examine the effectiveness of childhood overweight or obesity interventions addressing weight loss from 2002–September 2015.

Methods: The population focused on in this review were children who were overweight. The treatment group interventions focused on weight loss for overweight children, and included dietary, physical activity, life style changes, or a combination of treatments. Control groups received no treatment other than what they would usually receive in their normal daily lives including standard healthcare assessments. Outcomes for the studies were focused on whether the overweight children in the treatment groups lost weight.

Results: The criteria for the meta-analysis were met by 16 intervention studies, with a total of 19 outcomes reported within those studies. Two thousand, three hundred and seventeen participants ranged from 6 to 15 years of age with a mean age of 12 years or less. The majority of the 16 studies were conducted outside the United States (n = 13), with half reporting data on the cost of running the programming (n = 8) and were overwhelmingly conducted by interdisciplinary teams without nurses as members of the team (n = 13). The $M$ effect was $g = .732$, $p < .001$ with a 95% confidence interval of 0.351 to 1.113, with quality scores ranging from 20 to 29 out of a possible 41. The heterogeneity analyses overall Q score was 378, an I-squared of 95, with a fail-safe $N$ of 415.

Linking Evidence to Action: Diverse interventions included in this meta-analysis had a significant positive effect on weight loss in overweight children. Future research needs to focus on the role of the nurse in ensuring development and translation of the effective interventions in real world settings, at a scale that would move beyond small segments of the affected populations of overweight children.

BACKGROUND

Globally, childhood overweight and obesity are a public health crisis, (Karnik & Kanekar, 2012) leading to serious health concerns (World Health Organization [WHO], 2015) including type 2 diabetes mellitus, hypertension and cardiovascular disease, which can lead to increased morbidity and premature death (Reilly & Kelly, 2011). According to the World Health Organization (WHO, 2015) the prevalence of childhood overweight and obesity worldwide combined increased by 47% between 1980 and 2013. Currently, children who are between the 85th percentile and 94th percentile for age and gender are identified as “overweight” versus the previous term “at risk for overweight” (Ogden & Flegal, 2010). The categorical term “obese” has become the term for children whose body mass index (BMI) for age and gender was at or above the 95th percentile, versus the term “overweight” used earlier (Krebs et al., 2007). The rationale provided for changing the categorical terminology was to enable healthcare providers to more accurately assess and manage the serious issue of excess weight in children. Any child with a BMI at the 85th percentile or greater for age and gender would be considered to have excess weight, thus the term “overweight” will be used in this study to describe children with excess weight, regardless of weight category. Untreated excess weight in childhood can have long-term implications including adult obesity, hypertension, type 2 diabetes mellitus, and increased cardiovascular and cancer risk.

Intervention programs addressing childhood overweight increased between 1980 and 2002, yet it has remained difficult to identify which weight management interventions were most effective in helping overweight children lose weight. While
most studies of weight loss have been empirical and interventional, many lack theoretical guidance which would provide an opportunity to build knowledge about relevant variables and sustainable interventions over time. In 2006, a meta-analysis was conducted using studies published between 1980–2002 to examine the effectiveness of weight loss interventions in helping overweight children to lose weight (Snethen, Broome, & Cashin, 2006). No one specific intervention was found to be the most effective for weight loss in children. However, strategies that were consistently reported in the weight loss programs included some combination of dietary, exercise, and behavioral strategies, as well as the inclusion of parents in the interventions. Small samples, varied interventions and follow-up periods were reflected in most of the research conducted during those years. Specific issues included the overall limited success of weight loss interventions, which was often related to the short duration of the interventions, cost, or a lack of interest from members of the family regarding participation (Nichols, Livingston, & Schumann, 2002). Interestingly, nurses were rarely mentioned as members of the interdisciplinary research teams developing and implementing those intervention studies.

Another meta-analysis was conducted by Luttikhuis and colleagues (2009) on randomized controlled trials (RCTs) of obesity interventions that were implemented over 6 to 12 months. Treatments employed a variety of strategies including diet, exercise, and behavioral changes; these combined interventions were found to be most effective in achieving weight loss. However, the Luttikhuis et al. (2009) meta-analysis did not include any non-RCT intervention studies for treating overweight or obesity in children. Additionally, no studies in the Luttikhuis et al. (2009) meta-analysis were included that were conducted for less than 6 months or longer than 12 months. Luttikhuis et al. (2009) encouraged more research be conducted to identify the most effective strategies for treating childhood overweight or obesity.

Systematic reviews of childhood overweight or obesity focused on a variety of single potentially important influencing factors including parental involvement (Pinquart, 2014; Yavuz, Van Ijzendoorn, Mesman, & Van der Veek, 2014), school-based studies (Gonzalez-Suarez, Worley, Grimmer-Somers, & Dones, 2009; Lavelle, Mackay, & Pell, 2012; Sobol-Goldberg, Rabinowitz, & Gross, 2013), and types of treatment (Ho et al., 2013; Perez-Morales, Bacardi-Gascon, & Jimenez-Cruz, 2012), among others. However, no meta-analysis was found which, in addition to examining weight loss, focused on intervention studies conducted in other countries in over a decade (2002-September 2015), the nurse’s role within interdisciplinary teams conducting this research, or the cost of the interventions.

The purpose of this study was to examine studies related to overweight children and to determine which weight loss interventions were effective versus no intervention in promoting weight loss. A secondary aim was to review studies with children who were overweight to identify changes in the interventions and the weight loss outcomes now versus when the original meta-analysis study (Snethen et al., 2006) was conducted. The following research questions guided the meta-analysis when the weight loss interventions reported in the previous meta-analysis and the current one were compared:

1. In children who are overweight, have weight loss interventions changed or remained the same during the last decade?
2. For children who are overweight, were more interventions guided by theory between 2002 and September 2015?
3. Were there any differences in the effectiveness of weight loss intervention studies conducted with children in the United States versus those implemented outside the United States in the years between 2002 and September 2015?
4. For children who were overweight, were weight loss interventions more effective than standard care for weight loss?
5. How has the role of the nurse as researcher of weight loss interventions for children changed in studies conducted between 2002 and September 2015?
6. What is the cost of interventions designed for weight loss in children?

**METHODS**

**Design and Sample**

The authors used the meta-analytic strategies described by Moher, Liberati, Tetzlaff, and Altman (2009), which also were used in meta-analysis study by Snethen, Broome and Cashin (2006). A literature search was conducted for English-language-only journals using the keywords: obesity, children, intervention, weight loss, exercise, nutrition, and dietary. Searches were conducted in the following databases: Sociology abstracts, ERIC, CINAHL, MEDLINE, PsychINFO, Social Sciences, Health STAR, Health Source: Nursing/Academic Edition, ProQuest Nursing Journal, and Dissertation Abstracts. A manual search was also conducted at the university’s Golda Meir Library, as well as ancestry retrieval by reviewing reference lists of manuscripts identified during the search.

Level I evidence would have been optimal to include in this meta-analysis as randomized controlled trials (RCT) provide the strongest evidence for guiding practice (Melnyk & Fineout-Overholt, 2011). Studies retrieved from the literature search reflected a combination of quasi-experimental and randomized controlled trials. The selection criteria were the same as the initial meta-analysis and included: (a) participants who were children between the ages of 6 to 15 years, with a mean of 12 years of age, with a minimum of seven children per treatment or control group; (b) weight loss interventions were defined as any treatment activity, instruction, training or program designed
to induce weight loss in overweight children; (c) comparisons were made to control groups of children who did not receive any treatment targeted for weight loss, or engaged in only activities they would already be participating in as part of their normal routines, during the weight loss intervention study; (d) the primary outcome was the amount of weight-loss achieved during the treatment; (e) the study design included intervention studies conducted with two groups minimum including a control group; and (f) group means and standard deviations for weight loss were available in the published manuscripts. The only difference from the initial selection criteria were the publication dates, which were between 2002 and September 2015.

In the original meta-analysis, the goal was to include studies that had at least 10 participants per treatment and a control group. However, given the limited number of children enrolled in interventions studies during the time period when the study (Snethen et al., 2006) was conducted, the decision was made to include studies with samples as low as \( n = 7 \) per group and children 6 - 15 years of age.

Studies were excluded from this meta-analysis if: Children had additional chronic illness (e.g., asthma or diabetes; retrospective studies of children with chronic conditions), no control group, it was not an intervention study, participants outside age range, the control group received some form of intervention, weight loss was not a necessary component of the study, or data were not reported for analysis.

One thousand seven hundred and fifty articles were identified that appeared to meet the inclusion criteria (see Figure 1). The titles and abstracts of the studies were then reviewed by the research team, comprised of two senior researchers who conducted the earlier meta-analysis, as well as graduate and undergraduate nursing students, to ascertain whether each of the articles were consistent with the established inclusion criteria. Three hundred and fifty-four of the articles that were retained following the initial review of titles and abstracts (i.e., 236 deleted). The full texts of the 118 studies were further examined by the research team and an additional 98 were found to not meet all inclusion criteria, and were removed. The 20 remaining studies were examined again, as questions remained whether they had true control groups or data that could be used to obtain means for data analysis. Four additional studies were deleted from the meta-analysis after the decision was made that they did not have a true control group. Sixteen studies were found to meet all of the inclusion criteria.

The majority of the studies (\( n = 1,734 \)) that were deleted from the meta-analysis did not meet the selection criteria due to the following factors: (a) no control group, (b) participants did not meet age criteria, (c) no data were available for analysis.

Codebook

The codebook consisted of 36 fields of data including methodological variables which incorporated characteristics of sample (e.g., ages of the participants, number of males versus females, weight categories), the procedures for sampling, and the citation from which the manuscript was retrieved (Stuart, Broom, Smith, & Weaver, 2003). Substantive variables (Broome, 2000) were also identified and were comprised of the type of interventions (e.g., dietary, behavioral change, physical activity), the duration of the intervention, as well as the statistical data that was available for analysis (Snethen et al., 2006).

Team members filled out the codebook individually then compared the results to ensure accuracy as well as interrater agreement. Each arm of the study was listed as either control group or treatment group. Data were identified, retrieved from the articles, and assigned a code according to previous methods used in the study by Snethen and colleagues (2006). Additionally, Beck’s (1995) Quality of Study criteria were used to assess the quality of each article. This included the following fields: First author expertise (e.g., academic preparation), whether there was funding, sampling, outcome measures, study design, data collection, data analysis, and the number of study groups. Each field had subcategories that all had a score assigned, from 0 - 5. The scores were added up and the study assigned a number, with a higher score indicating a higher quality of the study.

Data Analyses

The findings for the synthesis of the data from the studies were analyzed using meta-analysis (Borenstein, Hedges, Higgins, & Rothstein, 2009) statistical procedures. The software package utilized was the Comprehensive Meta-Analysis version 3.0 software (Biostat, Inc., Englewood, NJ, USA). Statistical analysis included: (a) calculating means using a random effects model, (b) calculated Hedges' \( g \), (c) obtained a Q score measure for heterogeneity, and (d) calculated the Fail-safe \( N \). Quality of study scores were computed and assigned a total score.

RESULTS

All of the 16 studies were approved by an ethics review board, though the ethics approval structure varied depending on the country and location where the research was conducted. The studies yielded a total of 2,317 participants, with the treatment groups ranging in size from \( n = 18 \) to \( n = 446 \). Participants in the control groups ranged in size from \( n = 17 \) to \( n = 115 \). The overall treatment groups when combined together was \( n = 1,453 \), while the combined control groups had \( n = 748 \).

Children participating in the studies ranged in age from 6 - 15 years, with a mean age of 12 years or less.

The studies included 19 different treatment group interventions (see Table S1, available with online version of this article) across the 16 studies. The effect sizes for the 19 different treatment groups ranged from \( g = 0.016 \) (\( p = .902 \)) to \( g = 9.371 \) (\( p = .00 \)). The mean effect size was 1.392 with a 95% CI of -3.09 to 5.87. An independent \( t \) test was also conducted to examine whether there was a difference between the mean effect sizes of the original study, and the current meta-analysis. No
significant differences were found between the mean effect sizes of the two meta-analyses: $t(31) = .634, p = .531$.

The quality scores for the current 16 studies ranged from 20–29 with $M = 23.63, SD = 3.55$. The potential range of scores on the Beck quality measure range from 0 to a high of 41, indicating these studies had an overall moderate level of quality. A Pearson product-moment correlation coefficient was computed to assess the relationship between the effect size of the meta-analysis and the quality scores. There was no correlation between the effect size and quality scores ($r = -.244, n = 19, p = .313$), therefore, the quality of study information was not used to weight the effect size of each study.

The Heterogeneity Analyses

Testing for heterogeneity was completed to see if the effect sizes of the studies included in the meta-analysis were equal and homogeneous (null hypothesis), or if they varied and were heterogeneous. An overall Q score of 378 was calculated; the large Q score supported the view that the effects sizes for all the studies were not equal, and therefore heterogeneous based on some
study characteristics (Higgins, Thompson, Deeks, & Altman, 2003; Snethen, Broome, & Cashin, 2006). Another measure of heterogeneity was calculated, the 1/, which ranges between 0%–100%, with the higher the score indicating greater heterogeneity. The 1/ for this meta-analysis was calculated to be 95.243, indicating high level of heterogeneity (see Figure S1, available with online version of this article).

Additionally, an independent samples t test was conducted, to examine differences in the effect size in relation to the duration of the intervention. No statistically significant differences were found for the interventions < 6 months in length compared to > 6 months in length (t(17) = 1.213, p = .242 (see Table S2, available with online version of this article). The efficacy of an intervention did not appear to be associated with the length of time that the children were receiving the intervention.

Fail-Safe N
The stability of the findings from this meta-analysis was conducted by calculating a Fail-Safe N, using a moderate effect size. The Fail-Safe N calculated indicated it would take 335 unpublished studies that did not demonstrate weight loss with interventions to negate the findings from this meta-analysis (Long, 2001).

Changes in Interventions for Overweight in Children Over the Last Decade

Treatment. The type of weight loss interventions in the 16 studies included a total of 19 interventions (see Table S1). Similar to the original meta-analysis (Snethen et al., 2006) the current weight loss intervention strategies included education that was required to explain the treatment programs to the participants, and in many cases their parents. The weight loss interventions also varied from providing a single intervention (n = 5): Dietary (Rosado, Arellano, Montemayor, García, & Caamaño, 2008 [two interventions]), or physical activity (Farpoor-Lambert et al., 2009; Lazaar et al., 2007; Maddison et al., 2011). A majority of the studies (n = 14) used a combination of strategies: education and behavior (Wong & Cheng, 2013 [two interventions]; Yin, Wu, Liu, & Pare Yu, 2005); diet and physical activity (Carrel et al., 2005; Davis, Ventura, Cook, Gyllenhammer, & Gatto, 2011; Harder-Lauridsen et al., 2014); diet and education (Rosado et al., 2008); diet, physical activity, and behavioral changes (Adam, Westenhofer, Rudolphi, & Kraaibeek, 2009; Croker et al., 2012; Janicke et al., 2008; Korsten-Reck, Kromeyer-Hauschild, Wolfarth, Dickhuth, & Berg, 2005; Maddison et al., 2014; Reinhr, 2010; Satcher et al., 2010) (see Table S3, available with online version of this article).

Duration. The duration of the interventions were shorter in the original meta-analysis (Snethen et al., 2006), where they lasted 4 and 10 weeks (40%), or 3 months (40%). Over half of the interventions in this meta-analysis were implemented for > 6 months (54%). Sixty-three percent lasted for < 6 months, and of those, 32% lasted 3 months. M = 4.7 mo (SD = 1.84; see Table S3). No statistically significant differences were found in the effect size for the interventions < 6 months in length compared to > 6 months in length (t(17) = 1.213, p = .242.

Global settings. A marked expansion of weight loss intervention studies were reported from countries outside the United States over the past decade. The 16 studies included in this meta-analysis were conducted with diverse ethnic populations from 10 different countries (see Table S1). The majority (82%) of the studies were conducted outside the United States, an increase nearly double from the original meta-analysis in which 43% of the studies were conducted outside the United States.

Theoretical basis of the studies. In the original meta-analysis (Snethen et al., 2006) only one of the seven studies mentioned the use of a theory, though many of the interventions included behavioral components. The authors were interested in whether intervention studies in the current meta-analysis addressing childhood overweight or obesity had become more theoretically based. That is, could one see why the investigators expected this particular intervention to work and what framework was used to guide the variables in each investigation? Only three studies (Croker et al., 2012; Maddison et al., 2014; Sacher et al., 2010) of the 16 included in the current meta-analysis provided the theoretical basis for their study, suggesting that there is minimal theoretical guidance evident for interventions addressing childhood overweight or obesity.

Nursing role. Overall, the role of nurses in the studies in both meta-analyses were almost nonexistent. In the original meta-analysis which included seven studies, Figueroa-Colon and colleagues (1996) reports having nurses participate in the implementation of the intervention, while Braet, Van Winckel, and Van Leeuwan (1997) contacted school nurses via letters for recruitment purposes. In the current meta-analysis, Wong and colleagues (2013) reported that nurses were involved in conducting the motivational interviewing intervention that was implanted in the investigation. Another mention of nurses in the current meta-analysis was in the Harder-Lauridsen and colleagues (2014) study, which reported that investigators were working with school nurses; however, no additional details were provided. Additionally, in the last sentence of the discussion section of the Yin et al. (2005) study, the authors suggest that school nurses should work with children on changing their behaviors.

Cost of interventions. Participants in two of the seven studies in the original meta-analysis (Snethen et al. 2006) were charged a fee when they enrolled in their weight loss program. Senediak and Spence (1985) charged $30 to decrease dropout rates from the study, with incremental amounts coming back to the families as the children participated. However, Kirschenbaum, Harris, and Tomarken (1984) not only charged $50 to prevent dropout rates, but $30 for participation in the program. The cost of running an intervention study was not mentioned in any of the seven studies in the original meta-analysis. In the current meta-analysis, several of the 16 studies (Croker et al., 2005; Korsten-Reck et al., 2005; Reinhr et al., 2010), all
conducted outside the United States, discussed the issue of cost for the intervention programs. Yin et al. (2003) also discussed the need for cost-effective intervention programs that could be sustained. However, the investigators did not share the actual data on the cost of the interventions for the study, but stated whether grants or insurance providers covered the cost, and that some families had to provide a copayment (Korsten-Reck et al., 2003), while Harder-Lauridsen and colleagues (2014) mentioned it was free for families and Janicke et al. (2008) paid the families upon completion of each assessment.

**DISCUSSION**

There were several commonalities between the current meta-analysis and studies reported in the previously described Snethen, Broome and Cashin meta-analysis. These include the predominance of multicomponent intervention programs, the lack of nursing presence as investigators testing obesity interventions, and a dearth of theoretically grounded interventions reported in the literature. There also were differences in the two meta-analyses, including: An almost two-fold increase in the number of studies conducted outside the United States, larger treatment and control group sizes, longer duration of the intervention and study follow-up, and a beginning discussion about the cost of the interventions. All of the differences reflect greater sophistication in this area of research.

The multiplicity of environmental factors influencing the development of childhood overweight and obesity adds to the difficulty in designing an effective standardized intervention (Bronfenbrenner, 2005; Snethen & Broome, 2007). Although evidence supports that multimodal interventions targeting a variety of influencing factors at one time are the most effective, it is challenging to prescribe an intervention for a specific age group. Therefore, more contemporary tailored intervention models is the next step in this research (Lustria et al., 2013). Only one study that reported limiting an intervention to one treatment reported a significant effect size, suggesting that future research studies must test multiple components for their combined and synergistic effect.

Sustainability is one of the challenges of intervention programs. There are several factors related to the intensity or exposure to the intervention to consider, one being the cost related to the duration of the intervention, with duration and cost highly correlated (Epstein et al., 2014; Grow et al., 2014). Although costs of interventions to promote weight loss were discussed, no studies provided actual cost data. The economic modeling of weight loss and management interventions must also address direct costs of the interventions compared to the prevention of long-range health problems. This will be particularly important if insurance companies will be expected to support such interventions.

Utilizing theoretical models when developing and implementing a research study allows the investigator to predict what will happen and determine potential influencing factors. It is not clear why theoretical models were not more developed in these weight loss intervention studies. It is possible limited space in the manuscript precluded a description of the theory that grounded the intervention. Alternatively, the use of a theoretical framework may have been influenced by the interdisciplinary make-up of the research teams (e.g., healthcare providers, psychologists, nutritionists, exercise specialists), which varied with each study and country. Conversely, the researchers may not have found a theoretical model that appeared to be a good “fit” with the investigation or that the practitioners found to be useful.

An increasing number of international reports of weight loss intervention studies for children is encouraging, as reports in the literature indicate that increasing numbers of children are becoming overweight globally (De Onis, Blössner, & Borghi, 2010; Marshall et al., 2013; Nakano et al., 2010; WHO, 2015). There is no way to definitively know why there are fewer weight loss interventions conducted in the United States that were reported and met the criteria between the 2002–September 2015 timeframe. However, it was surprising given that the most recent 2011–2012 NHANES data indicates that there is an overall prevalence rate of overweight in the United States of 16.9% (95% CI, 14.9%-19.2%) for children 2 - 19 years of age (Ogden, Carroll, Kit, & Flegal, 2014). Clearly more emphasis needs to be placed on continuing to develop U.S.-based interventions for weight loss in children and teens in the future.

**LIMITATIONS**

A limitation of the investigation is that we did not contact the researchers of the original studies to obtain their data. Though we did reach out to some of the researchers with questions regarding their study, we did not receive responses. Our previous experience has been that researchers will not readily respond and share data if their study has been completed several years prior to the request. As most of the articles were from international authors, and in publication for 2 to 10 years, studies were excluded if no data was available for analysis.

Another potential weakness was the variation in definitions of overweight children across countries. All of the participants in the treatment and control groups were identified as having excess weight prior to the beginning of the study. However, there were some variations in how weight was identified as either obese or overweight. The weight criteria guidelines varied across studies and included the CDC guidelines, IOTF guidelines or country specific criteria. However, the majority of the studies (53%) included excess weight categories of overweight or obese; only obese participants (40%) or only overweight (7%).

Another limitation of this meta-analysis was that while participants in the treatment and control groups had excess weight prior to the initiation of the studies, no pretreatment weight category equivalence between the treatment and control groups was identified. Because of this, there was no way to determine if there were preintervention differences between treatment
and control groups may have been associated with changes in weight that were not due to the intervention.

**IMPLICATIONS FOR NURSING PRACTICE**

Unfortunately, the findings from this meta-analysis suggest that nurses are not involved in developing and testing effective weight management strategies for children who are overweight, yet nurses in a variety of practice settings are optimally prepared and positioned to advocate for changes in the effective management of childhood overweight or obesity including increasing their fruit and vegetable intake (Barkley, 2012; Berkowitz & Borchard, 2009), decreasing the intake of sugar sweetened beverages (Tipton, 2016), and assisting children to increase their physical activity while minimizing sedentary behaviors (Laws et al., 2015). According to Berkowitz and Borchard (2009), nurses who are involved at the community level may be in the best position to advocate for children who are overweight through engagement in policy changes, collaborative leadership, and social marketing campaigns.

**CONCLUSIONS**

The intervention literature reporting weight loss management in school-age and middle-school children has evolved over the past decade. More interventions were reported from other countries outside the United States, and studies now report more participants and longer duration of interventions and follow-up. Future research needs to focus on cost assessment and translation of the effective interventions in real world settings at a scale that would move beyond small segments of the affected populations of overweight children. **WVN**

---

**Author information**

Julia A. Snethen, Associate Professor, University of Wisconsin—Milwaukee, College of Nursing, Milwaukee, WI, USA; Marion E. Broome, Dean and Professor, School of Nursing, Vice-Chancellor for Nursing Affairs, and Duke University Associate Vice-President for Academic Affairs for Nursing, Duke University Health System, Durham, NC, USA; Pamela Treisman, Graduate Student, University of Wisconsin—Milwaukee, College of Nursing, Milwaukee, WI, USA; Erica Castro, Undergraduate Student, University of Wisconsin—Milwaukee, College of Nursing, Milwaukee, WI, USA; Sheryl T. Kelber, Biostatistician, Welsey Center for Nursing Research & Evaluation, University of Wisconsin—Milwaukee, College of Nursing, Milwaukee, WI, USA

Address correspondence to Dr. Julia A. Snethen, University of Wisconsin—Milwaukee, College of Nursing, 1921 East Hartford Ave., Milwaukee, WI 53211, USA; julia@uwm.edu

Accepted 31 October 2015
Copyright © 2016, Sigma Theta Tau International

---

**References**


doi:10.1111/wvn.12156

WVN 2016;0:1–9

**SUPPORTING INFORMATION**

Additional supporting information may be found in the online version of this article at the publisher’s website:

**Table S1.** Overview of Interventions for 16 Studies

**Table S2.** Duration of Intervention by Weeks, Effect Size (g), p Value

**Table S3.** Independent Variables, Effect Size (g), p Value

**Figure S1.** Funnel Plot of Standard Error by Hedge’s g