Abstract Title Page
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Title: How do vocabulary interventions affect young at-risk children's word learning**:** A Meta-analytic review.

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Abstract Body

Limit 5 pages single spaced.

Background / Context: *Description of prior research and its intellectual context.*
Learning the meanings of new words is an essential component of early reading development (Roskos et al., 2008). Vocabulary is at the heart of oral language comprehension and sets the foundation for domain-specific knowledge and later reading comprehension (Beck & McKeown, 2007; Snow, Burns, & Griffin, 1998). As Hart and Risley report (1995), vocabulary at age 3 is strongly associated with reading comprehension at the end of grade 3, and predicts the trajectory of word acquisition that impacts future academic learning. It is well established, however, that there are significant differences in vocabulary knowledge among children from different socioeconomic groups beginning in young toddlerhood through high school (Hart & Risley, 1995; Hoff, 2003). Extrapolating to the first four years of life, Hart and Risley (2003) estimate that the average child from a professional family would likely be exposed to an accumulated experience of about 42 million words compared to 13 million for the child from a poor family. Farkas and Beron (2004) in a recent analysis of the children of the National Longitudinal Survey of Youth 1979 cohort (NLYDY79), found that more than half of the social class effect on early oral language was attributable to the years before five, and that rates of vocabulary growth declined for each subsequent age period. Further, children from low-income groups tend to build their vocabulary at slower rates than children from high SES groups (Anderson & Nagy, 1992), potentially creating a cumulative disadvantage over time.

In addition, our previous meta-analysis on the effects of intervention on children's word learning (Marulis & Neuman, 2010) has shown that, while vocabulary interventions are effective in increasing children's word learning (overall effect size of .88), they are significantly less effective for low income at-risk children (g=.77, SE=.12 CI_{95}=.53, 1.01) than for middle to high SES (g=1.35, SE=.26, CI_{95}=.85, 1.85), $Q_b(1)=4.19$, $p<.05$. To date, the previous studies and meta-analyses (e.g., Mol, Bus, deJong & Smeets, 2008; Mol, Bus & deJong, 2009**;** Elleman, Lindo, Morphy, & Compton, 2009; Marulis & Neuman, 2010) have provided little information about the effectiveness of training on the improvement of at-risk children's early receptive and expressive vocabulary. This meta-analysis is designed to build on the existing knowledge base by examining vocabulary interventions specifically for factors associated with child outcomes for at-risk children.

Purpose / Objective / Research Question / Focus of Study: *Description of the focus of the research.*
Our goal was to examine not only how instructional practices affect child outcomes for at-risk children but also whether the effects of instruction differentially affect various types of at-risk children. Specifically, we addressed the following questions: 1) To what extent are vocabulary interventions an effective method for at-risk children prior to conventional reading instruction? 2) What factors (e.g., pedagogical, methodological, intervention, or design) are associated with significant word learning gains for children at-risk? 3) (How) are various risk populations (e.g., SES, ELL, low academic achievement, low vocabulary pretest scores) differentially affected? 4) How do cumulative risk factors affect children's vocabulary gains?

Setting: *Description of the research location.*
*N/A (meta-analysis)

Population / Participants / Subjects: *Description of the participants in the study: who, how many, key features or characteristics.*
*N/A (meta-analysis)

Intervention / Program / Practice: *Description of the intervention, program or practice, including details of administration and duration.*
*N/A (meta-analysis)
Research Design: *Description of research design (e.g., qualitative case study, quasi-experimental design, secondary analysis, analytic essay, randomized field trial).*
*Meta-analytic review (see below)
Data Collection and Analysis: *Description of the methods for collecting and analyzing data.*
Study Inclusion Criteria. In order to be included in our meta-analysis, studies had to meet the following criteria: a) Study participants were aged 0-6.0 (approximately birth through kindergarten) and were free of developmental or neurological impairments such as Down's syndrome, William's Syndrome or Cerebral Palsy but qualified as 'at-risk' such that 90% or more of the sample were from low-SES families, marginalized racial groups (e.g., African-American and Hispanic) or urban/rural communities, were English language learners (ELL), had language impairments, low previous vocabulary scores or low academic achievement; b) The study included a training, intervention or specific teaching technique to increase word learning (defined as receptive or expressive language); c) A (quasi-) experimental design was applied incorporating one or more of the following: a randomized controlled trial, a pretest-intervention-posttest with a control group, or a post-intervention comparison between pre-existing groups (e.g., two kindergarten classrooms); d) The study was conducted with English words, excluding foreign language or nonsense words; e) Outcome variables included a measurement of word learning, identified as either expressive or receptive vocabulary development or both.
Study Search and Retrieval. We searched the following electronic databases for published and unpublished studies: PsycINFO, ISI Web of Science, Education Abstracts ProQuest Dissertations & Theses and Educational Resources Information Center (ERIC CSA & OCLC FirstSearch) through September 22, 2008 using the following search term: Word learning OR Vocabulary AND intervention OR instruction OR training OR building OR experience OR learning OR development OR teaching. In order to maintain and code our library of citations, we imported them into the Bibliographic program Endnote. Using preliminary coding, 3,548 citations were deemed potentially relevant and subsequently retrieved and read in full. In addition to the electronic search, we contacted experts and authors in the field for any published and unpublished data (their own or that of colleagues) and relevant references. We received a 32% response rate, generating 36 manuscripts. Therefore, through both electronic search, manual search and author communication, we attained a total of 3,584 papers.
Inclusion Coding. Four University graduate students received extensive training in both general meta-analysis coding procedures and procedures specific to our vocabulary meta-analysis. Subsequently, a training set of 50 studies was coded separately by all coders. The level of agreement reached between the four raters on their inclusion determination (Fleiss' Kappa = .96) falls well within the “almost perfect agreement” range (Landis & Koch , 1977). Thus, each coder individually coded the remainder of the studies. Thirty-six papers met all five criteria.
Study Characteristics/ Potential Moderators. We also coded the characteristics of each study and intervention that we believed, based on past research and theory (e.g., NPR 2000, Mol et al, 2008 & 2009; Elleman et al, 2009, Marulis & Neuman, 2010; Coyne et al, in press) would influence child outcomes for at-risk children as well as all information related to participant risk factors. Due to the large number of variables and importance of accuracy, training was conducted for 6 hours per week over a 8 week period by the first author and involved tutorials on research design, variable coding and practical coding techniques. In addition, the first author created a coding sheet with accompanying coding manual. At the conclusion of the training, all four

coders coded 5 papers in full together with extensive discussion and revision of the coding manual and sheet in accordance to the sample studies. Next, the coders coded 5 more papers independently and met to compare and discuss. Fleiss' kappa was calculated for the four coders at .67, which, though falling within the "substantial agreement" range was not sufficiently high enough to allow for proper use of moderator analysis. Borenstein, Hedges, Higgins, and Rothstein (2009) and Lipsey and Wilson (2001) recommend an agreement level of at least .81. Therefore, we initiated a second round of coding and revisions to the coding sheets. We independently coded an additional 35 papers (64 studies; 150 effect sizes) and achieved an agreement level within the “almost perfect agreement” range (k=.89). Studies were then coded individually by one of the four trained coders.

Effect Size Calculation. To calculate effect size estimates, we entered the data into the statistical program *Comprehensive Meta-Analysis (CMA*; Borenstein, Hedges, Higgins, & Rothstein, 2005) and standardized by the change score standard deviations (SDs). All effect sizes were expressed as Hedges' *g*. We then weighted the effect sizes by the inverse of their error variances in order to factor in the proportionate reliability of each one to the overall analysis (Shadish & Haddock, 1994). In order to avoid dependency in our effect size data (e.g., when a study used more than one outcome measure or treatment group resulting in multiple effect sizes per study), we used the mean effect size for each study across conditions while not pooling the variable of interest in conducting the moderator analyses (Borenstein et al., 2009; Cooper & Hedges, 1994).

Publication Bias and Outliers. We examined publication bias using the classic fail-safe N test, which indicated that we would need to be missing 5,538 studies (with null results) to invalidate our results. This number far exceeded the criterion number (i.e., 5k+10=205 where k=39 studies, (Rosenthal, 1991)). None of our effect sizes qualified as outliers (i.e., 3 standard deviations above the sample mean; SD=.62).

Findings / Results: *Description of the main findings with specific details.*

Our sample comprised of 36 individual papers which yielded 39 studies and 112 effect sizes resulting in an overall effect size of 0.94, SE=0.10 CI_{95}=0.74, 1.14, $p<.01$. The effect sizes spanned from -.10 to 2.13 as can be seen in Figure 1 and Table 1 (please insert figure 1 and table 1 here). Our sample was largely heterogeneous: Q_{within} (38)=284.46, I^2=86.64 thus we conducted moderator analyses to explain variance / examine which factors of instruction were related to child outcomes.

Grade/Age. We found no significant difference between the gains received by kindergarten (g=1.13, SE=.17, CI_{95}=.80, 1.46) or preschool (g=.80, SE=.13, CI_{95}=.56, 1.05) at-risk children, $Q_b(1)$=2.46, p=.12. However, the meta-regression for age showed a significant slope; for every month in age, there was an increase of .03 in the effect size; β=.03, SE=.01, CI_{95}=.008, .05, Z=2.71, p=.007. See Figure 2 (please insert figure 2 here).

Risk Factors. We conducted moderator analyses for seven risk factors: low-SES, marginalized race, type of community, ELL, language impairments, low vocabulary pretest scores and low academic achievement. For details, see Table 2 (please insert table 2 here). The only significant difference found for type of risk factor was SES. At-risk children with low-SES status (*g*=.80, SE=.12 CI_{95}=.58, 1.03) received gains that were significantly lower than middle to high SES at-risk children (*g*=1.50, SE=.25, CI_{95}=1.01, 1.98), $Q_b(1)$=6.32, p=.01; Middle to high SES children who had at least one risk factor gained more than low-SES children with at least one additional risk factor.[i] These results suggest that poverty was the most serious risk factor affecting child outcomes rather than additional risk factors compounding the disadvantage.

Intervention Characteristics. As can be seen in Table 3, we also conducted eight planned moderator analyses related to intervention characteristics (please insert table 3 here).

Dosage

Frequency. There was no difference in effect sizes for studies with the median 30 sessions or less (*g*=1.00, SE=.21, CI_{95}=.59, 1.42) than those with more than 30 sessions (*g*=.94, SE=.18, CI_{95}=.58, 1.30), $Q_b(1)$=.05, p=.83. As this was a continuous variable, we conducted a meta-regression and found that the number of sessions was not significantly associated with effect size; β=-.004, SE=.002, CI_{95}=-.01,.001, Z=-1.68, p=.09.See Figure 3 (please insert figure 3 here).

Duration. There was no significant difference between studies with shorter durations than the median 56 days (g=.82, SE=.17, CI_{95}=.48, 1.16) and durations longer than the median (*g*=1.03, SE=.14, CI_{95}=.76, 1.30), $Q_b(1)$=.92, p=.34. Also, the slope was not significant for the meta-regression; β=-.001, SE=.001, CI_{95}=-.003,.002, Z=-.55, p=.58; Duration of intervention was not significantly associated with effect size. See Figure 4 (please insert figure 4 here).

Intensity. Again, there was no significant difference between interventions lasting more (g=1.12, SE=.21, CI_{95}=.70, 1.53) or less (g=1.16, SE=.20, CI_{95}=.76, 1.56) than the median 20 minutes, $Q_b(1)$=.03, p=.87 and the meta-regression slope was not significant; β=-.003, SE=.01, CI_{95}=-.03,.02, Z=-.21, p=.84. See Figure 5 (please insert figure 5 here).

Taken together, our results suggest that dosage of the vocabulary intervention on its own is not a mechanism significantly related to child outcomes for young children at risk.

Group size. There was no significant difference between interventions given individually (g=.97, SE=.18, CI_{95}=.61, 1.33), in small groups of five or less (g=.95, SE=.18, CI_{95}= .61, 1.30), or in large groups of six or more (g=1.17, SE=.35, CI_{95}= .49, 1.86), $Q_b(2)$= .32, p=.85. All group sizes appeared equally beneficial for at-risk children's word learning gains. This suggests that group size is also not a significant mechanism through which instruction affects child outcomes.

Interveners. Interventions conducted by child care providers who were non-certified/non-degreed (g=.23, SE=.11, CI_{95}=.02, .44) were significantly less effective than those conducted by parents (g=.71, SE=.26, CI_{95}=.21, .1.22), experimenters (g=.95, SE=.24, CI_{95}=.48, 1.42), or certified teachers (g=1.25, SE=.19, CI_{95}=.89, 1.62), $Q_b(3)$=25.91, p<.001. There was no significant difference between gains associated with interventions conducted by experiments, teachers or parents, $Q_b(2)$=3.06, p=.22. Our results suggest that the intervener may be an important mechanism related to child outcomes for young at-risk children as the majority of children aged 0-6, including at-risk children, spend a substantial amount of time with child care providers (NICHD, 2003) during their early word learning years.

Type of training. Explicitly taught word learning interventions had significantly higher gains (g=1.01, SE=.16, CI_{95}=.71, 1.32) than implicit/incidental word learning interventions (g=.57, SE=.13, CI_{95}=.33, .82), $Q_b(1)$=4.78, p=.03. In addition, interventions that combined both explicit and implicit instruction (g=1.52, SE=.17, , CI_{95}=.1.18, 1.85) were significantly more effective than either explicit alone (g=1.01, SE=.16, CI_{95}=.71, 1.32), $Q_b(1)$=4.79, p=.03, or implicit alone (g=.57, SE=.13, CI_{95}=.33, .82), $Q_b(1)$=19.83, p<.001. This distinction was useful because it allowed us to examine the pedagogical strategy within similarly-identified interventions. For example, one study examined implicit word learning through dialogic reading, while another intervention used direct instruction of words prior to dialogic reading. Our results suggest that the way in which words are taught is an important mechanism for vocabulary growth.

Target words selected. Studies whose experimenters specifically selected target words prior to the intervention (g=1.22, SE=.16, CI_{95}=.90, 1.54) had significantly higher effect sizes than those who did not (g=.73, SE=.12, CI_{95}=.49, .97), $Q_b(1)$=5.80, p<.05. Selecting words to be taught appears to be a mechanism for greater word learning (on both global and proximal measures).

Study Design Characteristics. We conducted two planned moderator analyses for study level characteristics. See Table 4 (please insert table 4 here).

Random assignment to conditions. Studies employing random assignment to conditions ($g=.53$, $SE=.15$, $CI_{95}=.23, .82$) had significantly lower effect sizes than those not employing random assignment to conditions ($g=1.07$, $SE=.12$, , $CI_{95}=.84, 1.31$), $Q_b(1)=8.10$, $p=.004$.

Nature of the control group. There was no significant difference between studies employing controls that received nothing ($g=.65$, $SE=.28$, $CI_{95}=.10, 1.21$), business as usual controls ($g=.77$, $SE=.21$, $CI_{95}=.36, 1.19$), alternate treatment control groups ($g=.97$, $SE=.22$, $CI_{95}=.53, 1.40$), or within-subjects controls ($g=1.32$, $SE=.23$, $CI_{95}=.86, 1.78$) ,$Q_b(4)= 4.33$, $p=.23$.

Outcome Measure Characteristics. Lastly, we found that interventions assessed with author-created tests ($g=1.37$, $SE=.20$, $CI_{95}=.98, 1.76$) had significantly higher effect sizes than those assessed with standardized measures ($g= .68$, $SE =.11$, $CI_{95}=.46, .91$), $Q_b(1)= 8.91$, $p=.003$. See Table 5 (please insert table 5 here). The standardized measures may provide a more accurate indication of word learning growth for at-risk children as they have a global scope.

Conclusions: *Description of conclusions, recommendations, and limitations based on findings.*

Our results provide strong evidence for the overall effectiveness of vocabulary interventions for young, at-risk children. The effect sizes obtained are considered both educationally significant (Lipsey & Wilson,1993) and large (Cohen, 1988). Due to the inclusion of 14 unpublished studies (36% of the sample) with significantly lower effect sizes (please insert table 6 here), it is possible that our overall effect size is a low estimate. However, the studies using random assignment ($g=.53$) and standardized outcome measures ($g=.68$) may be a more accurate representation of the effects of vocabulary intervention on at-risk children's word learning outcomes. Still, on the most conservative end of .53, a moderate word learning gain was obtained. This is tempered by the fact that 69% of the studies' participants (who reported vocabulary pretest scores) scored at or below the 16th percentile (standard score: 85) at pretest. Thus, even a large gain may not be enough to narrow the achievement gap for children with various risk factors. In addition, the children living in poverty with at least one other risk factor received the smallest gains and also tended to have the lowest baseline scores. In essence, interventions would have to accelerate, rather than merely improve, children's vocabulary development, to narrow the achievement gap. Our results indicate that even more powerful interventions than have generally been conducted are needed for at-risk children and that the mechanisms through which to achieve this are related to the type of intervener, the explicitness of instruction, and whether specific words are targeted prior to the intervention. The study that produced the largest effect size (Coyne et al, 2007, Study 1; $g=2.13$) provided direct teaching of specific words targeted in advance, with 'interactive opportunities..to interact with and discuss target words in varied contexts beyond those offered in the story' (p. 77). This exemplified instruction powerful enough to narrow the achievement gap. Neither the dosage nor the group size of the intervention were related to the magnitude of the child outcome suggesting that policy efforts focus on the quality of instructor and instruction, particularly for the at-risk children in poverty who may have the most limited access. Altogether, our meta-analysis provides some promising recommendations for classroom settings for at-risk children. However, these moderator analyses should not be interpreted as testing causal relationships (Cooper, 1998; Viechtbauer, 2007). Rather, our results should be verified through experimental manipulations that vary these factors systematically. This research, paired with our meta-analyses, would best elucidate the educational mechanisms through which practices and policies affect word learning outcomes and differentially affect at-risk children's word learning.

Appendices

Not included in page count.

Appendix A. References

References are to be in APA version 6 format.

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Appendix B. Tables and Figures
Not included in page count.

Table 1. *Key characteristics and effect sizes of meta-analyzed studies with at-risk participants*

ıuthor(s) name	Publication Status	At risk[a] (Coder-determined)	Trainer	Condition[b]	Type of Testing[cd]	Control Group[e]	ES (g)
ck & McKeown,)7, Study 1	publ	Yes	Teacher	SB	A	TU	1.5
ck & McKeown,)7, Study 2	publ	Yes	Teacher	SB	A	WS	1.9
rtnem, 2005	not publ	Yes	Experimenter	SB	S	TU	0.9
ickman, 2002	publ	Yes	Parent	SB	A&S	AT	0.3
yne et al., 2008	not publ	Yes	Experimenter	SB	S	WS	0.8
yne et al., in ss	not publ	Yes	Teacher	SB	A	WS	0.9
yne et al., 2007, ıdy 1	publ	Yes	Experimenter	SB	A+	WS	2.1
yne et al., 2007, ıdy 2	publ	Yes	Experimenter	SB	A+	WS	1.6
yne et al., 2004	publ	Yes	Experimenter	SB	A	AT	0.8
evecoeur, 2008	not publ	Yes	Teacher & Experimenter	SB	S+	TU	1.2
nger, 2003	publ	Yes	Experimenter	Play	S	TU	0.5
niels, 1994a	publ	Yes	Teacher	SL	S	AT	1.8
eman, 2008	not publ	Yes	Teacher	SB	A&S	AT	1.8
rgrave & ıechal, 2000	publ	Yes	Teacher	DR	A&S	AT	0.7
tice & Walpole,)5	publ	Yes	Experimenter	SB	A+	N	1.4
rweit, 1989	publ	Yes	Teacher	SB	S	M	0.3
mb, 1986	not publ	Yes	Experimenter	SB	S	N	0.1
ftus, 2008	not publ	Yes	Experimenter	VOC	A+	WS	0.4
nigan et al., 1999	publ	Yes	Experimenter	SB	S	TU	-0.1
nigan & ıitehurst, 1998	publ	Yes	Parent	DR	S	N	0.5
wenthal, 1981	publ	Yes	Teacher	LT	S	N	1.0
cas, 2006	not publ	Yes	Teacher	LT	S	AT	0.1
Connell, 1982	publ	Yes	Parent	IBI	S	TU	0.5
ehan, 1999	not publ	Yes	Parent & Specialist	SB	S	NA	0.9
ndelsohn, 2001	publ	Yes	Parent	SB +	S	N	0.4
ırphy, 2007	not publ	Yes	Experimenter	DR	S	TU	1.5
dler & Sebera, 71, Study 1	publ	Yes	Child care teacher	BEEP	S	N	0.4
dler & Sebera,	publ	Yes	Child care teacher	BEEP	S	N	0.1

71, Study 2							
uman & llagher, 1994	publ	Yes	Parent	SB + Play	S	N	1.4
uman, 1999	publ	Yes	Child care teacher	SB	S	TU	0.0
tari-Syverson et , 1996	not publ	Yes	Teacher	LTL	A&S	WS	0.6
a, 1973	publ	Yes	Teacher	TER	A&S	AT	1.7
iney, 1968	not publ	Yes	Teacher	SV	S	TU	0.2
verman, 2007a	publ	Yes	Teacher	MDV	A&S+	N	1.9
non, 2003	not publ	Yes	Teacher	SB +	A&S	TU	0.7
arren & Kaiser, 86	publ	Yes	Experimenter	LIP	S	N	1.5
asik & Bond, 01	publ	Yes	Teacher	IR	A&S	TU	1.4
asik et al, 2006	publ	Yes	Teacher	SB +	S	AT	1.5
hitehurst et al, 94	publ	Yes	Child care teacher & Parent	DR	A&S+	AT	0.6

Note. The symbol - indicates missing, insufficient, or unclear information.
[a] Sample was coded at risk if at least 50% of the participant sample was within one risk category: low SES (at or below the national poverty level of $22,000); parental education of high school graduation or below; qualification for free and reduced lunch; second language status; low achievement (as identified by teacher report, achievement or AYP); IEP or Title I placement.
[b]AB=Audio Books; AAC=Augmentative and Alternative Communications system; BEEP=Bilingual Early Childhood Educational Program; CAI=Computer-assisted instruction; DR=Dialogic Reading; IBI=Individual Bilingual Instruction; IR=Interactive Reading; LIP=Language Intervention Program; LT=Language Training; LTL=Ladders to Literacy; MDV=Multi-Dimensional Vocabulary; SB=Storybook; SL=Sign Language; SV=Sight Vocabulary; TER=Total Environment Room; VOC=General Vocabulary Intervention.
[c]A=Author-created; S=Standardized.
[d]+ includes a delayed posttest.
[e]n=Received no treatment (includes wait list); tu=treatment as usual; at=alternate treatment; ws=within-subject.

Table 2. *Mean Effect Sizes for risk factors*

Characteristic	***k***	***g***	**95% CI**	Q_{within}[a]	$Q_{between}$[b]	I^2
Socioeconomic status					6.61	
Low SES (90% of sample)	28	.79***	.57, 1.01	163.95		83.53
Middle to high SES	8	1.50***	1.01, 1.98	84.00		91.67
Marginalized race					1.56	
Yes (AA & H)	27	.86***	.62, 1.09	180.27		85.58
No	11	1.15***	.76, 1.53	78.79		87.31
Type of community					4.29	
Urban	20	.95***	.64, 1.26	198.92		90.45
Suburban	5	1.44***	.81, 2.06	14.29		72.01
Rural	6	.72***	.42, 1.02	10.69		53.22
English language learners					1.03	
Yes (90% of sample)	6	.66*	.02, 1.31	65.42		92.36
No	30	1.02***	.78, 1.26	198.18		85.37
Language impairment					.59	
Yes (90% of sample)	4	1.05***	.84, 1.26	3.08		2.62
No	35	.93***	.72, 1.14	277.72		87.40
Low vocabulary pretest					.28	
Yes	27	.85***	.62, 1.09	167.26		84.46
No	9	.98***	.56, 1.40	83.51		90.42
Low academic achievement					1.91	
Yes	20	1.08***	.83, 1.33	103.02		81.56
No	18	.78***	.42, 1.13	163.36		89.59

* $p<.05$

*** $p < .0001$

[a]Q_{within} refers to the homogeneity of each subgroup (df = k-1)

[b]$Q_{between}$ refers to the moderator contrasts (df =number of subgroups–1)

Table 3. *Mean Effect Sizes for Characteristics of Interventions*

Characteristic	*k*	*g*	95% CI	Q_{within}[a]	$Q_{between}$[b]	I^2
Dosage						
Duration of Training					.92	
2 weeks or less	4	1.29***	.61, 1.97	17.33		82.69
More than 2 weeks	32	.91***	.69, 1.14	242.02		87.19
Less than 56 days	14	.82***	.48, 1.16	56.08		76.82
More than 56 days	22	1.03***	.76, 1.30	206.04		89.81
Frequency					1.79	
5 sessions or less	4	1.29***	.61, 1.97	17.33		82.69
More than 5 sessions	20	.89***	.61, 1.17	107.93		82.40
18 sessions or less	6	1.30***	.80, 1.81	19.44		74.27
More than 18 sessions	17	.91***	.62, 1.19	86.48		81.50
30 sessions or less	12	1.00***	.59, 1.42	55.33		80.12
More than 30 sessions	11	.94***	.58, 1.30	71.33		85.98
Intensity						
20 minutes or less	11	1.16***	.76, 1.56	42.73		76.60
More than 20 minutes	11	1.12***	.70, 1.53	84.90		88.22
Fidelity check of intervention					.80	
Yes	16	1.05***	.73, 1.36	94.14		84.07
No	23	.86***	.61, 1.11	168.94		86.98
Group Size					.32	
Individual	6	.97***	.61, 1.33	19.18		73.93
5 or less	12	.95***	.61, 1.30	55.79		80.28
6 or more	7	1.17***	.49, 1.86	83.03		92.77
Intervener					25.91	
Experimenter	10	.95***	.48, 1.42	53.66		83.23
Teacher	15	1.25***	.89, 1.62	126.73		88.95
Parent	4	.71***	.21,1.22	14.71		79.60
Child care provider	5	.13*	.02, .44	5.21		23.19
Type of Training					20.16	
Explicit	10	1.01**	.71, 1.32	33.91		73.46
Implicit	15	.57***	.33, .82	74.19		81.13
Combination	11	1.52***	1.18, 1.85	45.41		77.98
Target words selected prior to intervention					5.80	
Yes	17	1.22***	.90, 1.54	111.25		85.62
No	21	.73**	.49, .97	135.59		85.25

* p<.05
*** p < .0001
[a]Q_{within} refers to the homogeneity of each subgroup (df = k-1)
[b]$Q_{between}$ refers to the moderator contrasts (df =number of subgroups–1)

Table 4. *Mean Effect Sizes for Study Design Characteristics*

Characteristic	*k*	*g*	95% CI	Q_{within}[a]	$Q_{between}$[b]	I^2
Design					8.09	
Random assignment	10	.53***	.23, .82	30.13		70.13
Non random assignment	29	1.07***	.84, 1.31	231.96		87.93
Type of Control group					4.33	
Received nothing (includes wait list)	4	.65*	.10, 1.21	12.49		75.98
Alt. treatment	10	.97***	.53, 1.40	47.44		81.03
Treatment as usual	11	.77***	.36, 1.19	85.94		88.36
Within-subjects	6	1.32***	.86, 1.78	31.62		84.19

* p<.05
*** p < .0001
[a]Q_{within} refers to the homogeneity of each subgroup (df = k-1)
[b]$Q_{between}$ refers to the moderator contrasts (df =number of subgroups–1)

Table 5. *Mean Effect Sizes for Outcome Measure Characteristics*

Characteristic	*k*	*g*	95% CI	Q_{within}[a]	$Q_{between}$[b]	I^2
Type of Assessment					8.91	
Author-created	8	1.37***	.98, 1.76	26.54		73.62
Standardized	23	.68***	.46, .91	148.58		85.19

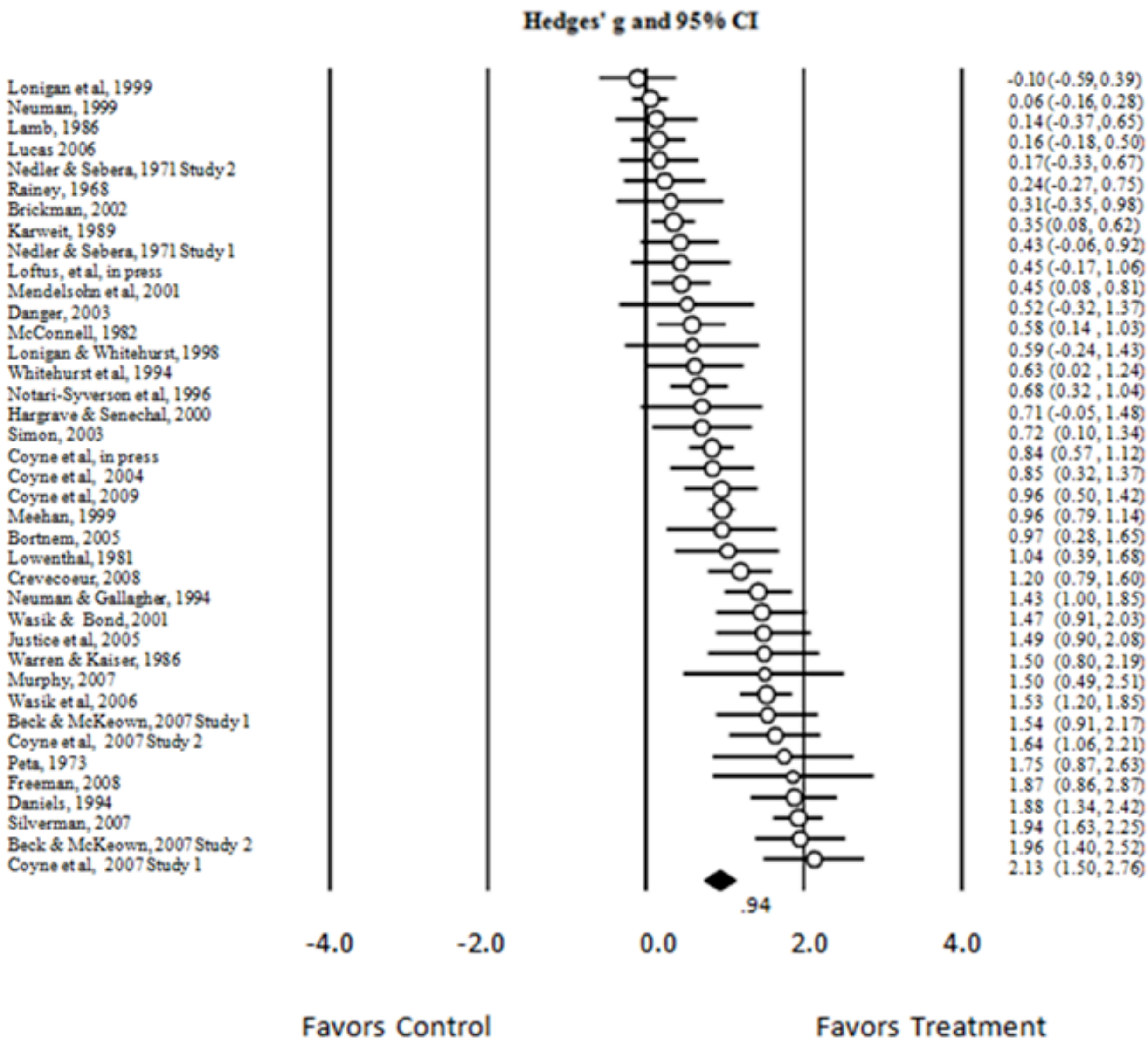
***p<.0001
[a]Q_{within} refers to the homogeneity of each subgroup (df = k-1)
[b]$Q_{between}$ refers to the moderator contrasts (df =number of subgroups–1)

Table 6. *Mean Effect Sizes for Publication Status*

Characteristic	*k*	*g*	95% CI	Q_{within}[a]	$Q_{between}$[b]	I^2
Publication Status					3.96	
Not Published	14	.70***	.48, .91	42.32		69.28
Published	25	1.07***	.77, 1.36	237.67		89.90

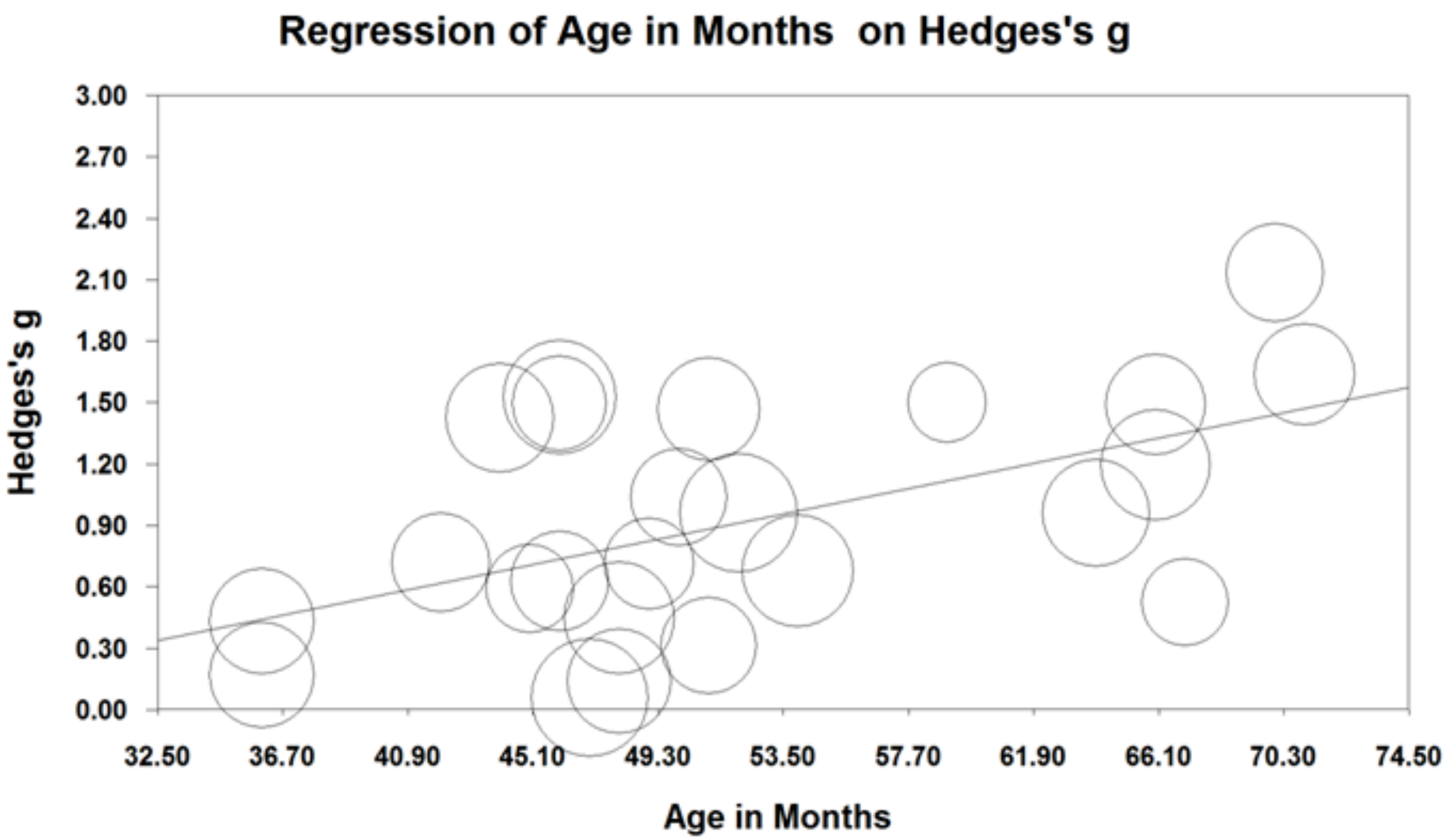
***p<.0001
[a]Q_{within} refers to the homogeneity of each subgroup (df = k-1)
[b]$Q_{between}$ refers to the moderator contrasts (df =number of subgroups–1)

Figure 1. Forest plot of effect sizes (k=39).



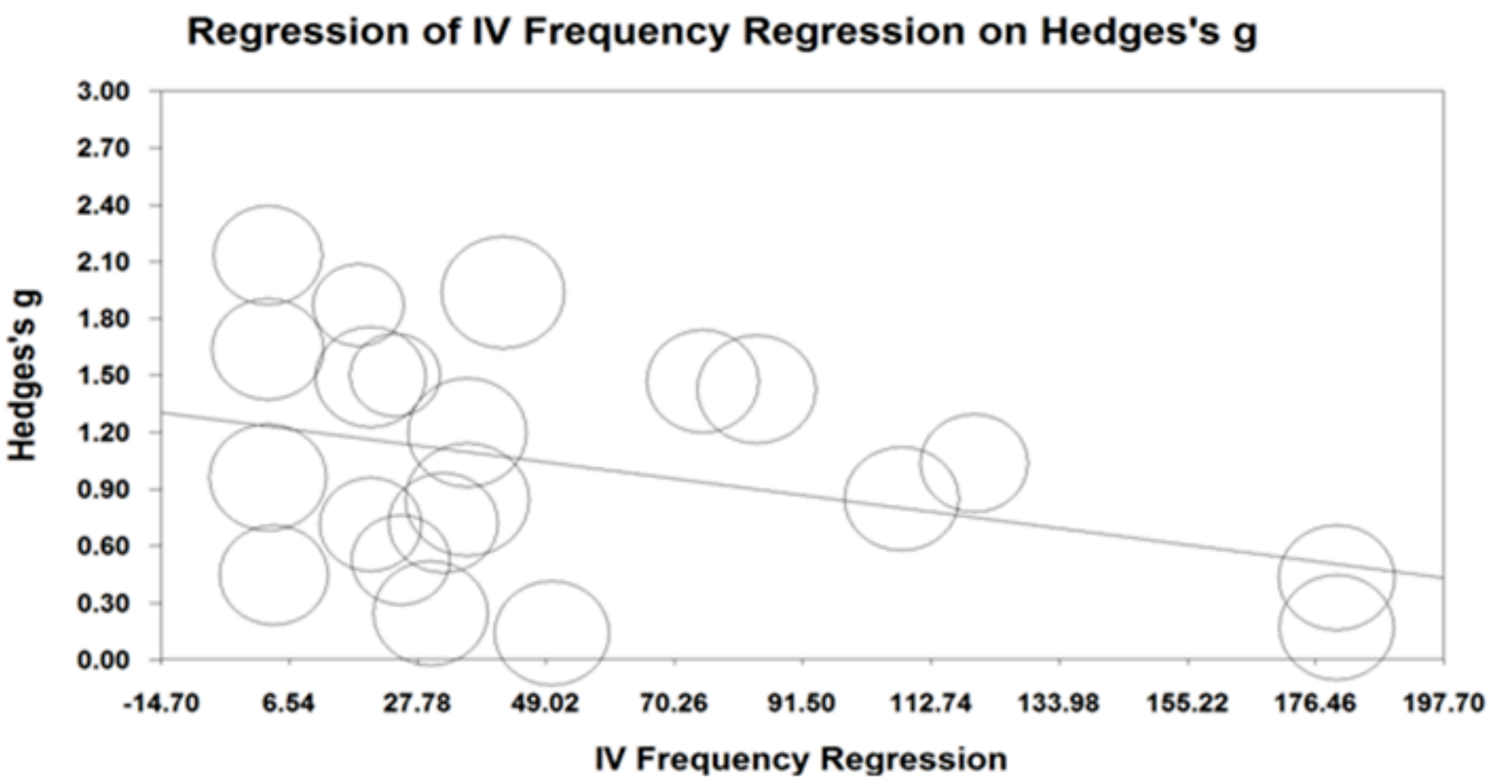
Note. Each circle represents each individual study and is proportionate to its weight in the overall analysis; the circles and confidence interval bars illustrate the estimated precision of each study. The diamond represents the mean effect size for the entire sample.

Figure 2. Meta-Regression of Age in Months.



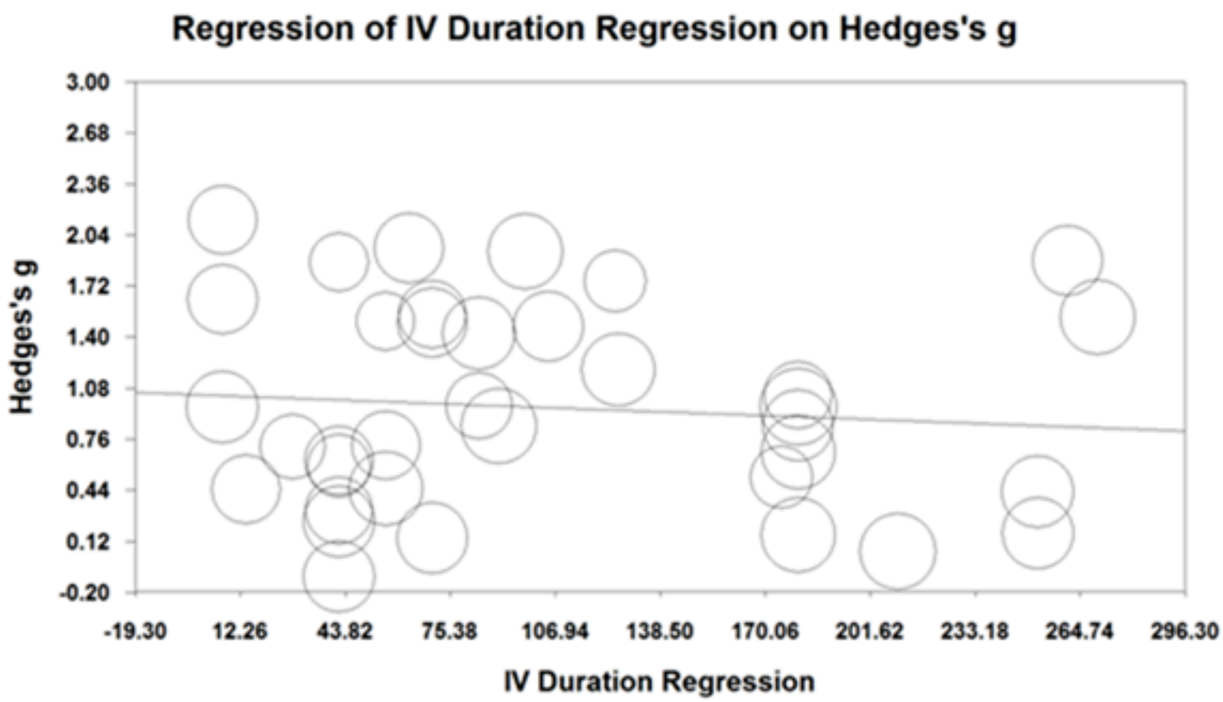
Note: The area of each circle is proportional to its weight in the overall analysis.

Figure 3. Meta-Regression of Number of Total Intervention Sessions.



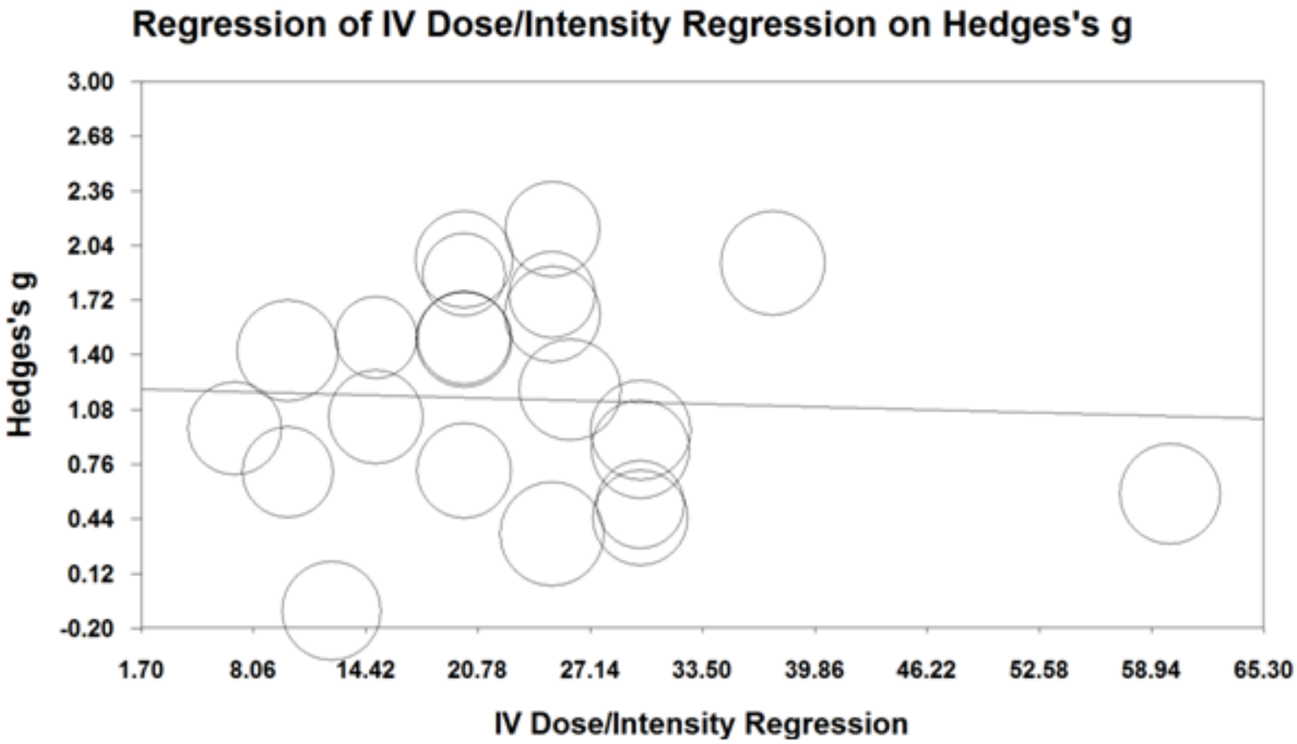
Note: The area of each circle is proportional to its weight in the overall analysis.

Figure 4. Meta-Regression of Duration of Intervention.



Note: The area of each circle is proportional to its weight in the overall analysis.

Figure 5. Meta-Regression of Length of Each Intervention Session.



Note: The area of each circle is proportional to its weight in the overall analysis.

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[i] In order to determine whether this difference was a function of the number of risk factors present (e.g., middle to high SES children having one risk factor compared to more than one risk factor for the low-SES plus an additional risk factor), we examined the median and mean number of risk factors for these two groups and found that they were quite similar. Both low-SES at-risk children and middle to high SES at-risk children had a median of 4 risk factors. The mean number of risk factors was only slightly higher for the low-SES group (4.0) as compared to the middle to high SES group (3.4). To examine this further, we conducted a meta-regression on number of risk factors and found that number of risk factors was not significantly associated with effect size: β=-.10, SE=.10, CI_{95}=-.30,.10, Z=-.10, p=.34.