

Review of the effects of technical assistance on program, organization and system change

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ABSTRACT

Findings from a synthesis of technical assistance models and frameworks were used to code the use of 25 core elements of technical assistance in studies and evaluations of implementation interventions to affect program, organization, and systems change. The 25 core elements were group into five components: preparation for the provision of technical assistance, development of a technical assistance plan, implementation of technical assistance, evaluation of the effects of technical assistance, and sustainability of technical assistance-facilitated changes. Results indicated that a subset of 11 core elements was related to between groups and between condition differences in the sizes of effect for program, organization, and systems changes. Results also showed that more intensive technical assistance was associated with larger sizes of effects compared to less intensive technical assistance and that particular combinations of practices were associated with the largest sizes of effect.

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1. INTRODUCTION

Technical assistance, in the broadest possible use of the term, refers to professional development, coaching and mentoring, consultation, and other supports provided to programs and organizations to affect change or adoption of evidence-based or innovative practices [1-3]. There is, however, no commonly accepted definition of technical assistance as noted by a number of experts [1, 4]. West et al. concluded, based on an extensive review of the effectiveness of technical assistance interventions, that “We were unable to find a commonly accepted definition of technical assistance in the published literature” [4].

The lack of a commonly accepted definition of technical assistance led a number of experts to propose working definitions of the term. A content analysis of these working definitions finds a number of common elements; namely, capacity building [4, 5], quality implementation [6], and quality improvement [7]. West et al. for example, defined technical assistance as “A dynamic, capacity-building process for designing or improving the quality, effectiveness, and efficiency of specific programmes, research, services, products, or systems” [4]. Katz and Wandersman proposed a similar definition: “Technical assistance is an individualized and hands-on approach to capacity-building in organizations and communities” [5].

A working definition of technical assistance, however, is only a first step toward operationalization of the term [8]. A second crucial step is defining the practices, tasks, steps, activities, elements, etc. that comprise technical assistance. This has been attempted by a number of investigators [5, 6, 9, 10] where findings were used to identify the core elements of technical assistance models and frameworks [11]. Twenty-five models and frameworks in early childhood intervention, education, health care, developmental disabilities, pregnancy prevention, child welfare, and youth development were systematically examined to

identify the core elements of the models and frameworks. Five components were identified with each component including between 4 and 6 core elements. The five components are (1) preparation for the provision of technical assistance, (2) the development of a technical assistance plan, (3) implementation of technical assistance, (4) evaluation of the effects of technical assistance, and (5) the sustainability of the changes, innovations, improvements, etc. facilitated by technical assistance.

Table 1 includes the descriptions of each core element in the five technical assistance components. The use or inclusion of each core element, as well as combinations of elements, in the studies and evaluations in our review were examined as factors contributing to the outcomes of technical assistance in terms of adoption and use of targeted intervention practices. Technical assistance was conceptualized as an implementation practice that included specific sets of activities (core elements) to affect changes in a program, organization, or systems [12] where variations in technical assistance would be expected to be related to variations in reported or observed changes in a program, organization, or systems [13]. Stated differently, the core elements are the types of practices that technical assistance providers use to achieve desired program, organization, or system change.

Studies and evaluations of the effects of technical assistance can be divided into two types of implementation practices: Practices that focus on changes or improvements in a program, organization, or system [14-16] and practices that focus on coalition building [17, 18] or community development [19]. The studies and evaluations examined in the present review included investigations where technical assistance was used to influence the adoption and use of evidence-based, innovative, or recommended practices in programs, organizations, or systems. Studies and evaluations of technical assistance for coalition building or community development were beyond the scope of the review.

Existing reviews of technical assistance studies and evaluations are primarily limited to descriptions of the technical assistance practices used to affect changes in programs, organizations, or systems [5, 6, 10, 15, 20]. One exemption is a review by West et al. [4]. These investigators included descriptive findings of both the core elements and the outcomes of technical assistance but did not relate the use of the practices to any of the study. Durlak and DuPre [3] as well included findings for both the degree of implementation of targeted practices and the study outcomes. Neither of these reviews, however, included attempts to quantitatively relate the use of technical assistance practices to any study or evaluation outcomes.

The extent to which the core elements in Table 1 were used in technical assistance studies and evaluations and were related to report or observed changes in program, organization, or systems practices was the focus of the review described in this paper. This was accomplished by coding the use of the 25 technical assistance core elements in Table 1 and relating the use of the core elements to differences in the technical assistance study and evaluation outcomes. This was done in a number of ways in order to unpack the influences of technical assistance to identify the particular core elements and conditions under which the core elements were associated with observed or report program, organization, or system changes. The expected outcome was the identification of the particular core elements or combinations of elements that proved most important in terms of explaining study and evaluation outcomes.

Table 1. Core elements of technical assistance

Core elements	Definitions of terms
Preparation for technical assistance	
1. Needs assessment	Process for determining the gap between current conditions, practices, or outcomes and desired conditions, practices, or outcomes
2. Decision-making	Process for involving program staff in identifying, among alternatives, the options or priorities that best fit with the organization's mission or goals
3. Visioning	Process for determining what an organization would do or "look like" if it was to make desired changes
4. Readiness for change (buy-in)	Staff commitment to change program, organizational, or systems practices to improve effectiveness in order to achieve desired changes or outcomes
5. Organizational capacity	Ability of an organization to commit the human, program, and other resources needed for a program, organization, or system changes to produce desired practices
Technical assistance plan	
1. Goals and objectives	The immediate (objectives) and long-term (goals) program changes and outcomes that are the desired benefits of TA
2. Intervention practices	The particular evidence-based intervention practice or best practices identified (targeted) to produce desired program, organizational, or systems change
3. Fit assessment	Determining how well the targeted intervention practice matches (fits) the program or organization's mission, priorities, desired changes, staff beliefs, etc. and how well the proposed TA practices also fit the program ecology
4. Logic model or theory of change	A description or graphic representation of the relationship between desired program, organizational, or system inputs and resources; the intervention practices, actions, or activities to affect desired change; and the intended outputs and outcomes of use of the practices, actions, or activities
5. TA resources	TA resources made available to and/or provided to program staff to improve the use of targeted evidence-based or best practices
6. Staff roles and responsibilities	Specification of the roles and responsibilities of individual staff, and how enactment of those roles and responsibilities, are expected to contribute to desired change
Technical assistance implementation	
1. TA provider credibility	Practices used by a TA provider to establish staff trust, respect, rapport, and beliefs that the provider is acting in the best interests of the program and staff receiving TA
2. Professional development	The evidence-based professional development practices used by a TA provider to build and strengthen staff, program, organization, and systems capacity to use targeted intervention practices
3. Coaching and mentoring	TA provider use of either or both coaching and mentoring as part of the provision of TA and in interactions with staff to build and strengthen their capacity to use targeted intervention practices
4. Consultation	Tailored responses to individual staff, small groups of staff members, and other program staff in response to questions, concerns, etc. about staff adoption and use of targeted intervention practices
5. TA provider support/feedback	TA provider nonjudgmental acknowledgment, encouragement, and feedback on staff efforts toward and accomplishment of changing program practices consistent with the objectives and goals of the plan
Technical assistance evaluation	
1. Process evaluation	Methods for determining if the practices, activities, or interventions specified (in a theory of change or logic model) were implemented as planned and resulted in identifiable outputs

Table 1. Core elements of technical assistance (*Continued*)

2. Outcome evaluation	Methods of determining if the practices, activities, or actions have resulted in desired changes and affect progress or benefits in the target group(s) of a program, organization, or systems
3. Fidelity of use of intervention practices	Extent to which the key characteristics of targeted practices that are the focus of TA were implemented in a manner in which they were designed to be used or delivered
4. Fidelity of use of TA practices	Extent to which the core elements of TA were used as intended and in a consistent manner with program staff responsible for use of the intervention practice constituting the focus of TA
5. Lessons learned	Knowledge gained from the use of TA to promote staff use of the targeted intervention practice(s) constituting the focus of TA and the use of that information to make changes or improvements in the overall implementation of program activities
Sustainability of TA-facilitated change	
1. Capacity-sustaining activities	The program, organization, or systems resources, activities, and professional supports that are used to sustain or maintain the changes that have been put into place as a result of TA-related practices
2. Continuous quality improvement	Processes used to ensure ongoing improvements in a program, organization, or systems that were the focus of TA
3. Ongoing TA provider support	Procedures used to provide either or both informal and formal TA supports to program staff after the completion of TA-related activities
4. Follow-up activities	Planned activities used to provide program staff opportunities to share concerns and accomplishments and to obtain input, feedback, suggestions, etc. from a TA provider

2. METHOD

2.1. Search strategy

Technical assistance studies and evaluations were located through searches of ERIC, PsycInfo, ProQuest Central, MEDLINE, and Google Scholar. These were supplemented by searches of the reference sections of all retrieved papers and reports as well as by searches of an EndNote library maintained by our Institute.

Candidate studies and evaluations were located using the search terms “technical assistance” AND “study OR evaluation OR investigation OR research.” Separate searches were conducted in the above sources for the search terms in the titles, abstracts, keywords, and the bodies of text since technical assistance is not a controlled vocabulary term in any of the electronic databases except MEDLINE. Results were sorted by relevance and the full texts of all retrieved documents were examined until no new candidate studies or evaluations were found.

2.2. Inclusion criteria

Studies and evaluations were included if an investigation examined the effects of technical assistance on the adoption and use of evidence-based, evidence-informed, innovative, or other recommended practices as part of program, organization, or systems change. Studies and evaluations of technical assistance that included only program recipient outcomes were excluded, as were recipient outcomes in studies and evaluations including both practice and program recipient outcomes. Eligible studies and evaluations needed to include between groups or between condition comparisons that permitted calculations of mean difference effect sizes for changes or improvements in targeted practices.

Studies and evaluation that met the inclusion criteria provided individualized technical assistance to targeted programs or organizations that included some type of training, professional development, coaching, mentoring, or other types of supports to promote practitioners' adoption and use of the practices that were the focus of technical assistance. The types of the technical assistance in each study or evaluation were examined to discern the intensity of the implementation practices to affect program, organization, or systems change. Fixsen, Blase, Horner and Sugai's [21] definition of intensive technical assistance was used to group the studies and evaluations into either intensive or less intensive approaches based on five key features (clarity, frequency, intensity, duration, and integrity). Clarity and integrity was measured in terms of the use of these particular core elements of technical assistance and frequency, intensity, and duration was determined from

an analysis of each of the study and evaluation reports. Half of the studies and evaluations (52%) were categorized as intensive technical assistance interventions, and half of the studies and evaluations were categorized as less intensive technical assistance.

Exclusion criteria as noted above, studies and evaluations that focused on coalition building or community development were also excluded from the review. Studies and evaluations that did not include a sufficiently detailed description of the make-up of technical assistance to affect program, organization, or systems change were also excluded. The latter typically included papers and reports that stated that the implementation practices included technical assistance but there was no description of the core elements of technical assistance used in the studies or evaluations.

2.3. Data preparation

A structured data coding form for each of the Table 1 core elements was used to code the presence or absence of the core elements in the studies and evaluations by searching electronic versions of each retrieved paper or report. The coding form included primary, secondary, and related terms for each core element (fidelity, adherence, or integrity) to identify all relevant core elements. The electronic searches were supplemented by reviewer examination of each study and evaluation to also be assured no core elements were missed. Ten of the 25 investigations (40%) were randomly selected and coded independently by two authors for calculating interrater agreement. Agreement was computed as the number of agreements divided by the number of agreements plus non-agreements. The median percent of agreement was 92 (Range=84 to 96). Disagreements were resolved by an author noting the presence of a core element not identified by other authors until there was 100% agreement.

The types of comparisons in the studies and evaluations were coded in terms of the research design used to determine the relationships between the core elements and sizes of effects for between group or between condition comparisons. Three different types of comparisons or contrasts were used to establish the effects of technical assistance: Between group posttest differences, between condition comparisons, and pretest-posttest differences. The dependent measures included the adoption and use of the practices that were the focus of program, organization, or systems change. Half of the investigations (52%) included only one outcome measure and the other half included multiple outcome measures.

2.4. Data analysis

Six sets of analyses were conducted to identify the relationships between the core elements and study and evaluation outcomes. We first determined for all 25 investigations which core elements were used in each of the studies and evaluations. Second, we calculated the average mean difference effect sizes and 95% confidence intervals for the outcomes in the studies and evaluations in the research reports to establish the efficacy of technical assistance. Third, we identified which particular core elements included in the studies and evaluations were associated with positive sizes of effect. Fourth, we evaluated the effects of the intensity of technical assistance on the sizes of effects for program, organization, and systems change. Fifth, we determined which core elements or combinations of core elements were associated with the sizes of effects for core element-outcome relationships. Sixth, we evaluated the influences of the two types of fidelity core elements (technical assistance and intervention) on the sizes of effects for program, organization, and systems changes to determine if hypothesized relationships were supported by the analyses of the effects of technical assistance on the study and evaluation outcomes [13, 21, 22].

Pattern matching [23] was used to identify which technical assistance core elements or combinations of elements used as implementation practices were related to the sizes of effects for the outcomes. A particular type of process pattern matching was used to determine, among all core elements, which elements were associated with positive outcomes in studies and evaluations that differed in terms of research designs and types of outcome measures [24]. Observed or obtained patterns were mapped onto the technical assistance study and evaluation outcomes as a basis for establishing core element outcome relationships.

In addition to pattern matching, other analyses were conducted to identify the relationships between (1) the combined use of the core technical assistance components and the study and evaluation outcomes, (2) different levels of technical assistance and the study and evaluation outcomes, and (3) specific combinations of core elements and the study and evaluation outcomes. The latter post hoc follow-up analyses were informed by the results of all of the preceding analyses.

3. RESULTS

3.1. Types of studies and evaluations

One hundred and fifty-five (155) technical assistance papers and reports were located and each examined in terms of the descriptions of core elements, the practices constituting the focus of investigation,

research designs, and the inclusion of data to compute mean difference effect sizes. Twenty-five (25) of the 155 studies and evaluations met the inclusion criteria. The majority of investigations were conducted in early childhood intervention programs or schools (70%). The other studies and evaluations were conducted in health care, human services, family and childcare programs, and community-based programs. Appendix A includes the list of 25 studies and evaluations.

The practices that were the focus of technical assistance included school-wide behavior supports, family systems intervention practices, classroom practices, care coordination, teacher-child interactions, inclusion practices, teaching quality, curricular practices, early childhood physical activity practices, child and family support, and different kinds of behavior management interventions. Most of the investigators stated that the practices that were the focus of technical assistance were evidence-based or evidence-informed interventions. Several other investigators stated that the practices that were the focus of technical assistance were innovative intervention practices.

The outcomes for measuring adoption of, adherence to, or improved use of the intervention practices constituting the focus of investigation included different measures of intervention fidelity [25, 26-28] and changes or improvements in the use of the practices constituting the focus of investigation [29, 30-32]. The majority of outcome measures included direct observations of expected changes or improvements in targeted practices whereas a number of investigations used rating scales for measuring observed or reported changes.

Information included in the studies and evaluations permitted 17 between group comparisons, 12 between condition comparisons, and 21 pretest-posttest comparisons. The between group posttest only design studies and evaluations were either experimental or quasi-experimental investigations where the use of technical assistance to affect changes in a program, organization, or systems was compared to outcomes in a program, organization, or systems not receiving technical assistance. The comparative condition design studies and evaluations included investigations where the effects of technical assistance were compared to less intensive technical assistance or alternative conditions (e.g., workshops). The pretest-posttest design evaluations compared program or organization outcomes before and after the provision of technical assistance.

3.2. Core elements

Table 2 includes the number and percent of core practices (elements) used in the 25 investigations. The core elements used most often in the technical assistance investigations were professional development (100%), explicit identification of targeted intervention practices (96%), technical assistance provider consultation (84%), identification of technical assistance and intervention goals and objectives (80%), technical assistance provider support and feedback (80%), needs assessment (76%), technical assistance recipient decision-making (76%), and a process evaluation for determining if expected changes were achieved (76%). This constellation of technical assistance practices indicates that among the 25 core elements, these particular practices “stand out” as most frequently used for the planning, delivery, and evaluation of the effects of efforts to affect program, organization, or systems change in the investigations in the review.

Inasmuch as intervention practice fidelity is an important measure for determining if a practice was adopted and used as intended, it was somewhat surprising to find that about one-third of the investigations did not include an explicit description of this type of measure. It was also surprising to find that only about half of the investigations included assessment of readiness to change since nearly all of the intervention practices that were the focus of technical assistance were offered to program staff rather than staff deciding the practices that would be the focus of technical assistance. It was not surprising to find that only about one-third of the investigations assessed fidelity of use of the technical assistance practices. This was the case since this type of fidelity has only recently been recognized as important for evaluating the effects of implementation practices on program, organization, or systems change [21, 22].

3.3. Effectiveness of technical assistance

The 25 studies and evaluations all included outcomes measures that provided evidence for whether technical assistance was associated with observed or reported changes. Table 3 shows the mean difference effect sizes and 95% confidence intervals for the three types of research design used in the investigations. Technical assistance was related to changes or improvements in the use of targeted practices regardless of the type of comparison as evidenced by statistically significant Z-tests for the between group or between condition comparisons.

The fact that the mean difference effect sizes for the between condition comparisons is smaller than those for the other two types of study designs was not unexpected. Whereas the comparisons for the between group and pretest-posttest studies both included contrasting groups or conditions not involving any technical assistance, the between condition comparisons involved some type of technical assistance vs. an alternative

type of professional development. The latter, therefore, would have been expected to have had at least a small effect on the measures constituting the focus of investigation which would have influenced the between condition differences.

Table 2. Core elements and practices included in the descriptions of the technical assistance studies and evaluations

Core elements	Number	Percent
Preparation for technical assistance		
Needs assessment	19	76
Decision-making	19	76
Readiness for change	14	56
Organizational capacity	7	28
Visioning	4	16
Technical assistance plan		
Intervention practices	24	96
Goals and objectives	20	80
Technical assistance provided resources	17	68
Logic model or theory of change	10	40
Staff roles and responsibilities	10	40
Fit assessment	8	32
Technical assistance implementation		
Professional development	25	100
Technical assistance provider consultation	21	84
Technical assistance provider support/feedback	20	80
Coaching and mentoring	16	64
Technical assistance provider credibility	7	28
Technical assistance evaluation		
Process evaluation	19	76
Intervention practice fidelity	17	68
Outcome evaluation	13	52
Technical assistance practice fidelity	9	36
Lessons learned	5	20
Sustainability of technical assistance-facilitated change		
Ongoing technical assistance provider supports	17	68
Capacity-sustaining activities	14	56
Follow-up technical assistance activities	13	52
Continuous quality improvement	8	32

Table 3. Mean difference effect sizes and 95% confidence intervals for the influences of technical assistance on adoption and use of targeted practices

Type of comparison	Number of effects	Mean effect size	95% CI	Z-test	p-value
Between group differences	17	.82	.38, 1.25	3.98	.0001
Between condition differences	13	.58	.45, .70	10.06	.0000
Pretest-posttest differences	21	.99	.58, 1.41	5.01	.0000

NOTE. CI=confidence interval.

3.4. Pattern matching

Each of the studies and evaluations for each type of research design was examined to identify which core practices were most often described in the reports and were associated with positive outcomes as evidenced by the sizes of effects for the between group or between condition comparisons. Inasmuch as different investigators used different terminology to describe the same or very similar core elements, those practices that had the same purpose (e.g., needs assessment and decision-making; technical assistance provider consultation and support) were combined for the pattern matching analyses.

Eleven of the 25 core elements were incorporated in those studies and evaluations that were associated with positive program, organization, or systems change. These are shown in Table 4. In the 25 studies and evaluations, with only a few exceptions, 75% to 100% of the investigations included these particular core elements. The results show which particular technical assistance practices were ones most frequently included in the studies and evaluations.

The core elements considered least often in the studies and evaluations, regardless of research design, were visioning, lessons learned, establishing technical assistance provider credibility, and evaluating organizational capacity to adopt and use targeted intervention practices. Other core elements infrequently considered in the studies and evaluations were an assessment of how well the targeted intervention practices

made sense (fit) in terms of a program or organization's mission or philosophy and fidelity of use of the technical assistance practices to affect program, organization or systems change.

Table 4. Percent of studies and evaluations including technical assistance (TA) core elements for positive changes in the use of targeted intervention practices

Core elements	Type of design		
	Between group	Between condition	Pretest-posttest
Technical assistance preparation			
Needs assessment/decision-making	100	100	100
Technical assistance plan			
Goals and objectives	100	100	73
Intervention practices	100	75	67
TA resources	75	75	93
Technical assistance implementation			
Professional development	100	100	100
TA provider consultation/support/feedback	100	100	67
Coaching and mentoring	75	75	53
Technical assistance evaluation			
Intervention practice fidelity	100	75	53
Process evaluation	89	100	67
Technical assistance sustainability			
Follow up/ongoing support	78	100	80
Capacity-building activities/CQI	67	100	67

NOTE. CQI= Continuous quality improvement.

3.5. Technical assistance intensity

The studies and evaluations were each examined to determine if the intensity of technical assistance was related to differences in the sizes of effects for between group and between condition comparisons. Table 5 shows the results for both research design and intensity of technical assistance. Several things can be discerned from these findings. First, regardless of research design or intensity of technical assistance, the implementation practices had positive effects on program, organization or systems change as evidenced by the 95% confidence intervals not including zero and statistically significant *Z*-tests. These findings indicate that technical assistance was effective in terms of having observed or reported changes compared to participants not receiving technical assistance or another type of training. Second, more intensive technical assistance was associated with larger sizes of effect compared to less intensive technical assistance. In all three sets of analyses, the average effect sizes for more intensive technical assistance were considerably larger and statistically different than the average effect sizes for less intensive technical assistance for the between group, $t=3.53$, $p=.0031$, $d=1.78$, between condition, $t=2.52$, $p=.028$, $d=1.47$, and pretest-posttest, $t=3.47$, $p=.003$, $d=1.52$, comparisons. The results indicate that the influences of technical assistance on the observed or reported program, organization, or system change were moderated by the intensity of the implementation practices for promoting the use of targeted intervention practices.

Table 5. Average effect sizes and 95% confidence intervals (CI) for intensive vs. less intensive technical assistance (TA)

Type of comparison	Number of effects	Mean effect size	95% CI	Z-test	p-value
Between group differences					
Intensive TA	6	1.56	.48, 2.65	3.72	.0002
Less intensive TA	11	.41	.20, .62	4.40	.0000
Between condition differences					
Intensive TA	5	.73	.57, .89	12.75	.0000
Less intensive TA	8	.48	.32, .64	7.07	.0000
Pretest-posttest differences					
Intensive TA	11	1.52	.89, 2.16	5.36	.0000
Less intensive TA	10	.41	.15, .68	3.52	.0004

The extent to which different sets of core elements were associated with the differences in Table 5 was determined by using technical assistance intensity as a grouping variable and the total number of core elements in each of the five technical assistance components as dependent variables in a series of between group *t*-test comparisons. Table 6 shows the results for the two levels of intensity of technical assistance.

Less intensive approaches to technical assistance included more preparation core elements compared to intensive approaches to technical assistance as evidenced by a statistically significant *t*-test and a medium size of effect for the between condition comparison. In contrast, more intensive approaches to technical assistance included more evaluation core elements compared to less intensive approaches to technical assistance also as evidenced by a statistically significant *t*-test and a large size of effect for the between condition comparison.

Table 6. Mean number of core elements in the intensive and less intensive technical assistance (TA) studies and evaluations

Core Elements	Intensive TA		Less intensive TA		<i>t</i> -test	<i>p</i> -value	Cohen's <i>d</i>
	Mean	SD	Mean	SD			
Preparation (5) ^a	2.18	0.91	2.83	0.93	2.49	.0164	.71
Planning (6)	3.45	0.86	3.69	1.00	0.88	.3827	.26
Implementation (5)	3.64	1.09	3.93	1.28	0.87	.3906	.24
Evaluation (5)	2.91	1.23	1.97	1.15	2.82	.0070	.79
Sustainability (4)	1.82	1.05	2.21	0.90	1.42	.1624	.40

^a Number of core elements each type of technical assistance practice.

Follow-up Chi-square analyses for 2 Between Group (Intensive Technical Assistance vs. Less Intensive Technical Assistance) X 2 Between Core Element (Included vs. Not Included) comparisons were used to identify the sources of the between group differences. More of the less intensive approaches to technical assistance included assessment of the organizational capability core element compared to the more intensive approaches to technical assistance, $\chi^2=6.76$, $p=.009$, $d=.78$. More of the intensive approaches to technical assistance included assessment of the outcome evaluation core element, $\chi^2=7.32$, $p=.007$, $d=.82$, and the measurement of fidelity of technical assistance core element, $\chi^2=6.50$, $p=.011$, $d=.76$, compared to the less intensive approaches to technical assistance.

3.6. Fidelity assessment

A particular interest as part of unpacking the effects of technical assistance on the sizes of effects for program, organization, and system changes was the influences of the inclusion of the fidelity of intervention practices and the fidelity of technical assistance core elements in the studies and evaluations. The investigations were grouped into those studies and evaluations including both fidelity core elements ($N=9$), those including either of the two fidelity core elements ($N=9$), and those including neither of the two fidelity core elements ($N=7$). Because the sizes of effects differed as a function of research design (Table 3), the effect sizes for each of the three types of contrasts or comparisons were centered where the centered sizes of effects were used as the dependent measures in a 3 Between Group AVOVA with a linear contrast.

The results from the analysis are shown in Figure 1. A downward pattern in the sizes of effects was found for the inclusion or exclusion of the two fidelity core elements. The inclusion of both core elements was associated with the largest size of centered effect sizes and the exclusion of both core elements was associated with the smallest size of centered effects. The Cohen's *d* for the downward linear trend was $d=.58$.

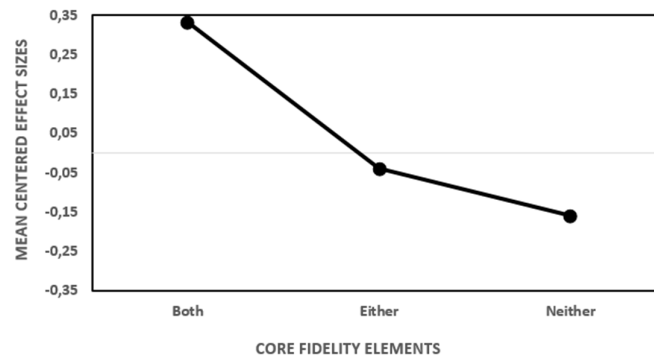


Figure 1. Studies and evaluations including fidelity of both implementation (technical assistance) and intervention, either of the two types of fidelity, and neither of the two types of fidelity measures

4. DISCUSSION

Results from the review of technical assistance studies and evaluations highlighted a number of core elements that were associated with between group and between condition differences in the sizes of effect for technical assistance implementation interventions. The particular core elements that were used in the largest number of studies and evaluations were needs assessment and practitioner decision making; professional development and technical assistance provider supports; process evaluation and assessment of intervention practice fidelity; and follow-up and ongoing technical provider supports to sustain observed or reported change.

The intensity of technical assistance used in the studies and evaluations was related to differences in the sizes of effects for changes or improvements in the use of targeted intervention practices, regardless of the particular practices that were the focus of investigation. More intensive technical assistance had more robust effects on the study and evaluation outcomes compared to less intensive technical assistance. Follow-up analyses found that studies and evaluations that included fidelity of both technical assistance practices and intervention practices were investigations that had the largest sizes of effects compared to investigations that paid less attention to these two core elements of technical assistance.

Findings from the review both add to an understanding of the core elements of technical assistance that proved most important in terms of explaining the adoption and use of evidence-based and evidence-informed intervention practices. Durlak and DuPre [3], West et al. [4], and others [5, 7] have extensively investigated the published literature to identify core technical assistance practices and the relationships between the practices and outcomes in studies of efforts to promote adoption and use of evidence-based and evidence-informed practices. The latter has been accomplished primarily by descriptive analyses of technical assistance-intervention practice relationships.

The review described in this paper included quantitative analyses of the manner in which core technical assistance practices were related to study and evaluation outcomes. An iterative data analysis procedure was used to identify which core elements proved most important in terms of the sizes of effects for the adoption and use of intervention practices constituting the focus of technical assistance. The review, therefore, differed from previous syntheses of technical assistance and related practices studies by the manner in which technical assistance practices were related to the study and evaluation outcomes.

As part of our review, technical assistance was conceptualized as an implementation practice that would be expected to be a major determinant of the degree to which targeted intervention practices were adopted and used as part of program, organization, and systems change [1, 9, 12]. According to Dunst, et al. [13], the fidelity of use of implementation practices would be expected to be related to variations in adoption and fidelity of use of intervention practices. As noted by Fixsen, et al. [12], “implementation processes [e.g., technical assistance]...should be described in sufficient detail such that independent observers can detect the presence and strength of the ‘specific set of activities’ related to the implementation”. Technical assistance as described and investigated in this paper used a specific set of core elements as implementation practices to affect changes or improvements in intervention practices.

5. CONCLUSION

The importance of explicit attention to the fidelity of both technical assistance practices and intervention practices emerged as robust predictors of the effects of technical assistance. Future research on technical assistance would therefore benefit from explicit assessment of the fidelity of both implementation and intervention practices and the manner in which the two types of practices are related, in order to further our understanding of technical assistance-intervention practice relationships.

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Appendix A
Technical Assistance Studies and Evaluations

no	author	Title	source
1	Abell, E., Arsiwalla, D. D., Putnam, R. I., & Miller, E. B.	Mentoring and facilitating professional engagement as quality enhancement strategies: An overview and evaluation of the family child care partnerships program.	<i>Child Youth Care Forum</i> , 2014, No. 43
2	Becker, K. D., Bradshaw, C. P., Domitrovich, C. E., & Jalongo, N. S.	Coaching teachers to improve implementation of the good behavior game	<i>Administration and Policy in Mental Health</i> , 2013, No. 40
3	Berry, S., Barovechio, P., Mabile, E., & Tran, T.	Enhancing state medical home capacity through a care coordination technical assistance model.	<i>Maternal and Child Health Journal</i> , 2017, No. 21
4	Bradshaw, C. P., Mitchell, M. M., & Leaf, P. J.	Examining the effects of schoolwide positive behavioral interventions and supports on student outcomes : Results from a randomized controlled effectiveness trial in elementary schools	<i>Journal of Positive Behavior Interventions</i> , 2010, No. 12
5	Brown, C. H., Chamberlain, P., Saldana, L., Padgett, C., Wang, W., & Cruden, G.	Evaluation of two implementation strategies in 51 child county public service systems in two states: Results of a cluster randomized head-to-head implementation trial.	<i>Implementation Science</i> , 2014 No. 9
6	Chinman, M., Ebener, P., Malone, P. S., Cannon, J., D'Amico, E. J., & Acosta, J.	Testing implementation support for evidence-based programs in community settings: A replication cluster-randomized trial of Getting To Outcomes.	<i>Implementation Science</i> , 2018, No. 13
7	Clark, N. M., Cushing, L. S., & Kennedy, C. H.	An intensive onsite technical assistance model to promote inclusive educational practices for students with disabilities in middle school and high school.	<i>Research & Practice for Persons with Severe Disabilities</i> , 2014, No. 29 (4)
8	Cowley, K. S., Nilsen, K. L., & Ceperley, P. E.	Evaluation of a high-need school district's organizational capacity for change.	Charleston, WV: AEL https://archive.org/details/ERIC_ED438991/page/n15 .
9	Domitrovich, C. E., Gest, S. D., Gill, S., Bierman, K. L., Welsh, J. A., & Jones, D.	Fostering high-quality teaching with an enriched curriculum and professional development support: The Head Start REDI program	<i>American Educational Research Journal</i> , 2009 No. 46(2),
10	Dunst, C. J., & Raab, M.	Practitioners' self-evaluations of contrasting types of professional development	<i>Journal of Early Intervention</i> , 2010 No. 32
11	Dunst, C. J., Trivette, C. M., & Deal, A. G.	Effects of in-service training on early intervention practitioners' use of family systems intervention practices in the USA	<i>Professional Development in Education</i> , 2011 No. 37
12	Early, D. M., Maxwell, K. L., Ponder, B. D., & Pan, Y.	Improving teacher-child interactions: A randomized controlled trial of Making the Most of Classroom Interactions and My Teaching Partner professional development models	<i>Early Childhood Research Quarterly</i> , 2017, No 38
13	Fox, L., Hemmeter, M., Snyder, P., Binder, D. P., & Clarke, S.	Coaching early childhood special educators to implement a comprehensive model for promoting young children's social competence	<i>Topics in Early Childhood Special Education</i> , 2011, No. 31(3)
14	Horner, R. H., Sugai, G., Smolkowski, K., Eber, L., Nakasato, J., Todd, A. W., & Esperanza, J.	A randomized, wait-list controlled effectiveness trial assessing school-wide positive behavior support in elementary schools	<i>Journal of Positive Behavior Interventions</i> , 2009, No. 11(3)
15	Landry, S. H., Anthony, J. L., Swank, P. R., & Monseque-Bailey, P.	Effectiveness of comprehensive professional development for teachers of at-risk preschoolers	<i>Journal of Educational Psychology</i> , 2009, No 101(2)
16	LaRowe, T. L., Tomayko, E. J., Meinen, A. M., Hoiting, J., Saxler, C., Cullen, B., & Initiative, W. E. C. O. P.	Active early: One-year policy intervention to increase physical activity among early care and education programs in Wisconsin	<i>BMC Public Health</i> , 2016, No. 16

17	Lassen, S. R., Steele, M. M., & Sailor, W.	The relationship of school-wide positive behavior support to academic achievement in an urban middle school	<i>Psychology in the Schools</i> , 2006, No. 43(6)
18	McDougal, J. L., Clonan, S. M., & Martens, B. K.	Using organizational change procedures to promote the acceptability of prereferral intervention services: The school-based intervention team project	<i>School Psychology Quarterly</i> , 2000, No. 15(2)
19	McInerney, M., & Hamilton, J. L.	Elementary and middle schools technical assistance center: An approach to support the effective implementation of scientifically based practices in special education	<i>Exceptional Children</i> , 2007, No. 73
20	Nelson, J. R., Martella, R. M., & Marchand-Martella, N.	Maximizing student learning: The effects of a comprehensive school-based program for preventing problem behaviors	<i>Journal of Emotional and Behavioral Disorders</i> , 2002, No. 10(3)
21	Newton, J. S., Algozzine, B., Algozzine, K., Horner, R. H., & Todd, A. W.	Building local capacity for training and coaching data-based problem solving with positive behavior intervention and support teams	<i>Journal of Applied School Psychology</i> , 2011, No. 27(3)
22	Newton, J. S., Horner, R. H., Algozzine, B., Todd, A. W., & Algozzine, K. M.	A randomized wait-list controlled analysis of team-initiated problem solving processes	<i>Journal of School Psychology</i> , 2012, No. 50
23	Ray, M. L., Wilson, M. M., Wandersman, A., Meyers, D. C., & Katz, J.	Using a training-of-trainers approach and proactive technical assistance to bringing evidence based programs to scale: An operationalization of the interactive systems framework's support system	<i>American Journal of Community Psychology</i> , 2012, No. 50(3)
24	Ross, S. W., & Horner, R. H.	Bully prevention in positive behavior support: Preliminary evaluation of third-, fourth-, and fifth-grade attitudes toward bullying	<i>Journal of Emotional and Behavioral Disorders</i> , 2014, No. 22(4)
25	Taylor-Greene, S., Brown, D., Nelson, L., Longton, J., Gassman, T., Cohen, J., . . . Hall, S.	School-wide behavioral support: Starting the year off right	<i>Journal of Behavioral Education</i> , 1997, No. 7(1)