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## **Research Article**

# Moving Triadic Gaze Intervention Into Practice: Measuring Clinician Attitude and Implementation Fidelity

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**Purpose:** This research investigated a first step in implementing the dynamic assessment (DA) component of Triadic Gaze Intervention (Olswang, Feuerstein, Pinder, & Dowden, 2013; Olswang et al., 2014), an evidence-based protocol for teaching early signals of communication to young children with physical disabilities. Clinician attitudes about adopting external evidence into practice and implementation fidelity in DA protocol delivery were examined following training.

**Method:** Seven early intervention clinicians from multiple disciplines were trained to deliver the four essential elements of the DA protocol: (a) provide communication *opportunity*, (b) *recognize* child's potentially communicative signal, (c) *shape* child's signal toward triadic gaze, and (d) reinforce with *play*. Clinician attitude regarding adopting

ommunication sciences and disorders, similar to education and other health care disciplines, has encouraged its professionals to conduct evidencebased practice (EBP), which requires integration of the available external research evidence, internal clinical expertise, and client perspectives (Dollaghan, 2007). The present study examines one component of EBP: how external,

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evidence into practice was measured at baseline and follow-up, with the Evidence-Based Practice Attitude Scale (Aarons, 2004). Implementation fidelity in delivering the protocol was measured for adherence (accuracy) and competence (quality) during trial implementation. **Results:** Clinicians' attitudes about trying new evidence that at first was perceived as incongruent with their practice improved over the course of the research. Clinicians demonstrated strong adherence to the DA protocol; however, competence varied across clinicians and appeared related to child performance. **Conclusions:** The results provided insight into moving Triadic Gaze Intervention into practice and yielded valuable information regarding the implementation process, with implications for future research.

empirically supported protocols are implemented in clinical practice. Enthusiasm for moving such protocols into practice is often high, but the process of doing so is hardly simple or straightforward. Many variables influence the success of implementing external evidence into clinical practice, key to which is how well clinicians can learn and then deliver laboratory-designed protocols in everyday work settings. The success of implementation is influenced by clinician attitudes about adopting new approaches into routine practice and clinician adherence to and competence in delivering an intervention as designed. This article investigates the process of moving one empirically supported protocol for assessing early communication behaviors in children with physical disabilities into a birth-to-three practice setting. The research examined changes in clinician attitude from pre- to posttraining; implementation fidelity (adherence and competence of protocol delivery) following training; and the impact of fidelity on child performance. This research represents a first step in investigating variables in clinician training that could affect protocol adoption.

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## Triadic Gaze Intervention: Assessing and Treating Early Communication in Young Children With Physical Disabilities

Young children with physical disabilities, such as cerebral palsy, are at high risk for delayed development of early signals of communication. Complicated developmental profiles can profoundly disrupt production of conventional behaviors (e.g., gestures, vocalizations) and interrupt critical teaching and learning opportunities during social interactions with caregivers and others (Halle, Brady, & Drasgow, 2004; Iacono, Carter, & Hook, 1998; Olswang, Pinder, & Hanson, 2006; Paparella & Kasari, 2004; Pinder, Olswang, & Coggins, 1993). Thus, early intervention is crucial to teach behaviors that facilitate social engagement and joint attention (Arens, Cress, & Marvin, 2005; Goossens' & Crain, 1987; Paparella & Kasari, 2004; Pinder & Olswang, 1995; Pinder et al., 1993; Reinhartsen, 2000; Wetherby, Yonclas, & Bryan, 1989). For children with adequate vision in the presence of motor and other sensory limitations, gaze is an important early behavior to target in treatment (Olswang et al., 2006; Pinder & Olswang, 1995; Pinder et al., 1993; Wetherby et al., 1989). In particular, triadic gaze (TG), or a three-point gaze shift between an adult and a desired object (object-adult-object or adult-object-adult), can be a powerful signal of coordinated joint attention and, thus, intentional communication.

For two decades, research at the University of Washington has investigated the benefits of an intervention for teaching TG to 10- to 24-month-olds with physical disabilities (Olswang et al., 2006, 2014; Olswang, Feuerstein, Pinder, & Dowden, 2013; Pinder & Olswang, 1995; Pinder et al., 1993). Triadic Gaze Intervention (TGI; Olswang et al., 2013; Olswang et al., 2014) includes two components: dynamic assessment (DA) and treatment. Both components include four essential elements: (a) provide a communication opportunity, (b) recognize the child's potentially communicative signal, (c) shape that signal toward TG, and (d) reinforce with *play* (see Olswang et al., 2013; Olswang et al., 2014, for a complete description of TGI). The DA is a structured protocol administered once, prior to treatment, to identify appropriate target behaviors (what to treat) from a continuum of early communication behaviors (see Figure 1) and to shape strategies to elicit those behaviors (how to treat). The DA reveals a child's potential to learn TG and assists the clinician in planning treatment that targets its production. The DA is followed by direct treatment, traditionally delivered by a speech-language pathologist (SLP). Treatment is designed to teach, practice, and stabilize child behaviors, culminating in the production of TG as a signal of coordinated joint attention and a means of successfully interacting and communicating with caregivers and others. Treatment is more fluid than DA and complements other early intervention treatment objectives (e.g., gross and fine motor developmental goals).

The research program supporting the TGI protocol consisted of a series of single-subject feasibility studies and a randomized control study, during which children from Figure 1. Communication continuum.

Preintentional	<ul> <li>Single focus (gaze alone)</li> <li>Single focus (gaze + gesture OR vocalization)</li> <li>Single focus (gaze + gesture AND vocalization)</li> </ul>
	<ul> <li>Dual focus (gaze alone)</li> <li>Dual focus (gaze + gesture OR vocalization)</li> <li>Dual focus (gaze + gesture AND vocalization)</li> </ul>
Intentional	<ul> <li>Triadic focus (gaze alone)</li> <li>Triadic focus (gaze + gesture OR vocalization)</li> <li>Triadic focus (gaze + gesture AND vocalization)</li> </ul>

community birth-to-three centers were assessed and treated under controlled conditions (Olswang et al., 2014, 2006; Pinder & Olswang, 1995; Pinder et al., 1993). This research program documented promising results for targeting TG as an early signal of communication for children with physical disabilities. The findings demonstrated that TGI can be a successful protocol for enhancing children's communication. However, this research has also captured the variability in children's rate and degree of learning to produce TG. In the presence of such variability, the TGI DA can be used to document an individual child's actual level of performance, predict his or her immediate potential for learning TG, and thus support intervention planning by determining what and how to teach (Olswang et al., 2013).

## Integrating External Evidence Into Practice

The current climate of health care reform demands that clinicians integrate such external evidence into clinical practice. Evidence supporting TGI, combined with interest in the TGI DA as voiced by early interventionists, argued for exploring this protocol in routine service delivery for young children with physical disabilities. Abundant research has shown that disseminating information via professional conferences and/or journal publications is insufficient to integrate external evidence into routine care (e.g., Decker, Jameson, & Naugle, 2011). Instead, the process of moving evidence-based protocols into practice must be systematically investigated among clinicians' day-to-day demands and priorities. Findings would enhance researchers' understanding of the TGI protocol, the nuances involved in training clinicians, and the process of adopting the protocol into routine practice.

The implementation process, which consists of numerous iterative stages of investigation, is complex and influenced by many variables (see Olswang & Prelock, 2015, for a discussion). During one early part of the process, the installation stage, activities prepare the practitioner for "doing things differently" (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005, p. 16). Fundamental to installation is clinician training, which ensures that the protocol can be delivered as intended (Fixsen et al., 2005). Successful training should yield positive change in clinicians' attitudes and strong implementation fidelity. Assessing clinicians' attitudes about the evidence, before and after training, provides information about the likelihood of clinicians adopting and sustaining the protocol. Assessing implementation fidelity following training provides information about training effectiveness for learning and performing protocol elements.

#### **Clinician Attitudes**

Clinician attitudes can influence the adoption of empirically supported protocols across the stages of implementation (Decker et al., 2011). Attitude is multifaceted and can be influenced by individual personality traits, organizational constraints, or even county, state, or federal policies or regulations (Aarons, 2004). Further, clinicians can have complex, even contradictory views about adopting evidence into practice, "[being] positively predisposed to [EBPs] on one dimension and negatively predisposed on another" (Aarons, Cafri, Lugo, & Sawitzky, 2012, p. 2). In addition, attitudes may change over time as clinicians gain experience with the evidence.

Aarons (2004) has identified four domains that contribute to clinician attitude toward accepting and adopting evidence into practice: appeal, requirements, openness, and *divergence*. *Appeal* addresses the intuitive attractiveness of the evidence. For example, according to L. H. Cohen, Sargent, and Sechrest (1986), information recommended by colleagues is viewed as more desirable than information from a research article. An organizational *requirement* to implement change can be met with positive or negative reactions. The openness of a workplace climate can also influence clinician attitude. When openness is associated with job development or advancement, attitudes regarding innovation typically are positive (Aarons, 2004). Also, divergence has to do with the extent to which the clinician perceives the innovation as clinically useful and more or less valuable than clinical experience (Aarons, Cafri, et al., 2012). This framework offers a productive way to understand the clinician's perspective as one important contextual variable contributing to the success (or failure) of implementing evidence into practice (Aarons, Hurlburt, & Horwitz, 2011).

The Evidence-Based Practice Attitude Scale (EBPAS; Aarons, 2004; Aarons et al., 2010; Aarons, Cafri, et al., 2012) is one tool for measuring clinician attitude via a survey, addressing the four domains described previously (appeal, requirements, openness, and divergence). This questionnaire quantifies clinician attitudes that might reflect readiness for learning and implementing evidence into practice. In a variety of health care settings, it has been used to better understand the relationship between clinician attitude and implementation success (Aarons, Glisson, et al., 2012). Clinicians' attitudes can reveal the intricacies of moving evidence into practice, and most importantly, guide communication with clinicians during training. Further, understanding how clinicians' attitudes may change as they learn about evidence may influence implementation success.

#### **Implementation Fidelity**

*Fidelity*, otherwise termed internal integrity or procedural reliability, describes the ability of individuals to administer protocols accurately and competently (Billingsley, White, & Munson, 1980). In implementation research, fidelity refers to the "degree to which an intervention is implemented as it is prescribed in the original protocol or as it was intended by the program developers" (Proctor et al., 2011, p. 69). Two significant fidelity variables are (a) adherence to the protocol's essential elements and (b) competence, or quality, in delivering those elements (see Kaderavek & Justice, 2010, for a tutorial on examining fidelity in speechlanguage pathology).

Adherence and competence can be evaluated via (a) self-report from clinicians delivering the intervention or participants receiving the intervention, (b) direct observation of clinician behavior, either in real time or recorded sessions, or (c) some combination of these approaches (Breitenstein et al., 2010). The advantage of direct observation is that clinician performance can be compared with a gold standard template of delivery (Billingsley et al., 1980). Direct observation is frequently used for adherence, where actual performance is compared with expected performance, vielding percentage accuracy. Evaluating competence is more challenging, as it relates to "how the intervention content is delivered and responded to" (Domitrovich, Gest, Jones, Gill, & DeRousie, 2010, p. 285). Competence, therefore, includes factors such as clinician enthusiasm and engagement with a client as he or she delivers a protocol, as well as the degree to which he or she understands the intervention and ways that are appropriate for adapting it for a particular client (Domitrovich et al., 2010). Given the subjective nature of judging competence, rating scales are often used to rate performance along a continuum, typically ranging from expert delivery to adequate, poor, or absent delivery (Dusenbury, Brannigan, Falco, & Hansen, 2003). As with any observational evaluation, both adherence and competence require operational definitions to achieve valid and reliable outcomes.

## Contributions of Attitude and Fidelity to the Implementation Process

Clinician attitudes and implementation fidelity data contribute to the success of the implementation process in two ways. First, attitude and fidelity assessment can influence understanding of the empirically supported protocol and the potential ease of integrating it into practice. For example, poor attitude ratings raise questions about the protocol's alignment with clinical needs, organizational requirements, and clinician experience. Weak fidelity outcomes can reveal protocol elements that are challenging to learn and perform, which can negatively affect adoption. In this case, these challenging elements can be scrutinized, to reconsider their relative merit and/or identify alternate training approaches.

Second, attitude and fidelity measures appear tied to client outcomes. In particular, positive attitudes and strong fidelity can optimize service delivery, increasing the likelihood of outcomes similar to those documented in efficacy studies (Aarons, Glisson, et al., 2012; Durlak & DuPre, 2008; Dusenbury et al., 2003; Green & Glasgow, 2006). However, sometimes, in an authentic setting, tension can arise between delivering an empirically supported protocol as designed and adapting it to meet that setting's needs and priorities (Glasgow et al., 2006; Green & Nasser, 2012; Green & Glasgow, 2006). For example, if clinicians view new evidence as incongruent or unnecessary, they may adapt the protocol to fit their needs or simply not implement it at all (Aarons, 2004).

Further, empirical studies generally show that variations in delivery fidelity yield variations in client outcomes (Domitrovich et al., 2010; Durlak & DuPre, 2008). Some researchers argue that strict protocol adherence is necessary to achieve expected and desired outcomes, as adaptations may reintroduce elements that have already been deemed nonessential, thus changing the essential nature of the intervention itself (Dusenbury et al., 2003). An alternate view contends that some degree of cautious adaptation is necessary to meet the needs of stakeholders (e.g., clients, families, clinicians, administrators, service settings) and to reduce threats to external validity (D. J. Cohen et al., 2008; Green & Glasgow, 2006; Green, Glasgow, Atkins, & Stange, 2009). In the end, the amount of adaptation that can occur in protocol delivery without negatively affecting client outcomes may be protocol dependent and, thus, requires further investigation. Implementation research should reveal which elements of an empirically supported protocol are easy to train and yield strong versus weak fidelity and how these differences affect client outcomes. Such findings can guide refinement of the protocol and training to promote adoption of the new procedures.

## The Current Study

As part of a larger program of implementation research, this pilot study was a first step in systematically moving TGI protocol, specifically the TGI DA, into practice. Following conventional frameworks (Damschroder & Hagedorn, 2011; Fixsen et al., 2005; Powell et al., 2012), this research targeted the installation stage of implementation, during which clinicians were trained to deliver the essential elements of the TGI protocol in the context of their daily demands and priorities. Clinicians' attitudes about adopting external evidence and their posttraining fidelity to the TGI protocol served as the primary outcome measures; child performance was a secondary outcome measure. Thus, primary and secondary research questions were posed.

Primary research questions were the following:

- 1. Does clinician attitude change from pre- to posttraining, as measured by the EPBAS (Aarons, 2004)?
- 2. Following training, what degree of fidelity is demonstrated by clinicians when administering the DA protocol, as measured by adherence (percentage accuracy) and competence (quality ratings)?

The secondary research question was the following:

3. Is adherence or competence related to child performance?

## Method

## **General Procedures**

This research investigated the installation stage of implementation through clinician training. Clinicians' attitudes about adopting external evidence into clinical practice and their fidelity in delivering the TGI protocol's four essential elements during trial implementation with a child on their caseloads were examined. Seven clinicians from one early intervention center in the Seattle, WA, area participated in the research. Figure 2 presents a schematic of study activities, including training procedures. The study was conducted in four phases, over 3 months. At baseline and follow-up, data were gathered regarding clinician attitudes about adopting evidence. The training taught the TGI protocol and its four essential elements. During trial implementation, data were gathered on clinician fidelity in delivering the DA protocol.<sup>1</sup>

## **Participants**

#### **Recruitment and Enrollment**

Clinicians were initially approached by their site coordinators via e-mail and invited to an informational meeting. The second author conducted four meetings, which consisted of a brief overview of TGI, a description of the children for whom TGI was designed, and an explanation of the project, including inclusionary criteria (described in the following). A total of 44 individuals attended the meetings, including occupational therapists, physical therapists (PTs), and SLPs (n = 29 clinicians), family resource coordinators (n = 7), early educators (n = 4), and administrators or staff (n = 4). Nine of the 29 clinicians consented (nonclinicians were excluded); seven completed all study procedures. Figure 3 presents the study flowchart from recruitment through data analysis.

#### **Participant Characteristics**

Table 1 summarizes demographic characteristics of the nine initially enrolled clinicians. Two enrolled PTs, in boldface in Table 1, participated in the baseline phase but did not complete the training. Educational backgrounds ranged from bachelor's to clinical doctoral degrees. All were certified in their respective professions. Total years practicing ranged from < 1 to 22 years (M = 7.8, SD = 7.6, Mdn = 6.0). Years serving infants or toddlers with physical disabilities ranged from < 1 to 22 years (M = 7.1, SD = 7.0, Mdn = 6.0).

The cotreatment approach to service delivery used by the early intervention center from which we recruited subjects was maintained for this research project. Following this model, six of the seven participating clinicians

<sup>&</sup>lt;sup>1</sup>Only clinician performance on the DA was examined, which corresponded to their trial implementation task. The DA is designed as a one-time, structured delivery of the TGI protocol, in contrast to the more fluid delivery of treatment. This corresponded to their trial implementation task.

Figure 2. Four research phases and corresponding activities. EBPAS = Evidence-Based Practice Attitude Scale; TGI = Triadic Gaze Intervention.



worked in pairs (typically one SLP paired with an occupational therapist or PT). One clinician worked independently because her cotherapist was lost to attrition. Only one pair of clinicians delivered the DA protocol to the same child; all other pairs delivered the DA protocol to two different children. To ensure that TGI was appropriate for children enrolled in the study, all children met the following criteria: (a) age between 10 and 24 months at time of consent; (b) moderate to severe motor delay, defined as a score of  $\geq 2$  SDs below the mean on either the Fine Motor or Gross Motor Subscales of the Bayley Scales of Infant and Toddler Development–Third Edition (Bayley, 2006); (c) adequate vision, as demonstrated by sustaining gaze and tracking objects; (d) adequate hearing,



Recruitment	Attended informational meeting (n = 44) • SLPs (n = 12) • OTs (n = 11) • PTs (n = 6)	
	<ul> <li>FRCs (n = 7)</li> <li>Educators (n = 4)</li> <li>Administrators/Staff (n = 4)</li> </ul>	Did not consent to participate $(n = 35)$
Consent	Consented to participate (n = 9) • SLPs $(n = 4)$	<ul> <li>FRCs, educators, &amp; administrators not eligible (n = 15)</li> <li>Reason unknown (n = 20)</li> </ul>
Enrollmont	<ul> <li>OTs (n = 2)</li> <li>PTs (n = 3)</li> </ul>	<ul> <li>Did not complete training (n = 2)</li> <li>Changed jobs (n = 1)</li> </ul>
Enronnen	Completed training ( <i>n</i> = 7) • SLPs ( <i>n</i> = 4) • OTs ( <i>n</i> = 2) • PTs ( <i>n</i> = 1)	• <i>Lack of time</i> ( <i>n</i> = 1)
Analysis	Analyzed $(n = 7)$	

Feuerstein et al.: TGI Implementation: Clinician Attitude and Fidelity 1289

#### Table 1. Subject demographics.

No.	Race	Ethnicity	Highest degree earned	Certification	Years practicing	Years serving infants or toddlers with motor impairments
1	White	Not Hispanic or Latino	Master's	SLP	6	6
2	White	Not Hispanic or Latino	Master's	SLP	2	2
3	White	Not Hispanic or Latino	Master's	SLP	1	1
4	White	Not Hispanic or Latino	Master's	SLP	0.75	1
5	White	Not Hispanic or Latino	Bachelor's	OTR/L	13	10
6	White	Not Hispanic or Latino	Bachelor's	OTR/L	13	9
7	White	Not Hispanic or Latino	Master's	PT	22	22
8	White	Not Hispanic or Latino	Master's	PT	12	12
9	White	Not Hispanic or Latino	Clinical doctorate	DPT	0.60	1
M (SD)					7.8 (7.6)	7.1 (7.0)
Median					6.0	6.0

*Note.* SLP = speech-language pathologist; OTR/L = occupational therapist, registered/licensed; PT = physical therapist; DPT = doctor of physical therapy. The two PTs in boldface participated in the baseline phase but did not complete the training.

judged by caregiver report; (e) interest in toys and people, as revealed through change in muscle tone, facial expression, vocalization, and/or direction of gaze; (f) not yet producing TG or demonstrating symbolic communication (e.g., words, signs); and (g) caregiver who spoke English.

#### **Procedures and Data Collection**

The research project consisted of four phases (see Figure 2), conducted across a 3-month period: (a) baseline (one 1.5-hr meeting); (b) training (two 1.5-hr meetings plus one approximately 0.5-hr practice session with a child); (c) trial implementation (one approximately 0.5-hr trial implementation session with a different child); and (d) follow-up (one 1.5-hr meeting). The research team led the baseline, training, and follow-up meetings at the center after work hours. Clinicians conducted practice and trial implementation sessions in children's homes.

#### **Baseline Phase**

The baseline phase consisted of one 1.5-hr meeting. During this meeting, nine participants anonymously completed the EBPAS (Aarons, 2004), a 15-item questionnaire with strong psychometrics, to examine clinician attitudes about adopting new practices. The scale's 15 items cluster across four domains: openness to using empirically supported protocols (four items; e.g., "I am willing to use new and different types of therapy or interventions developed by researchers"); divergence of routine practice from research-based protocols (four items; e.g., "Research-based treatments or interventions are not clinically useful"); appeal of EBP (four items; e.g., "If you received training in a therapy or intervention that was new to you, how likely would you be to adopt it if it was intuitively appealing?"); and likelihood of adopting an EBP given requirements to do so (three items; e.g., "If you received training in a therapy or intervention that was new to you, how likely would you be to adopt it if it was required by your agency?"). Respondents rate their degree of agreement with each EBPAS item along a 5-point Likert scale (0 = not) at all, 1 = slight extent, 2 = moderate extent, 3 = great extent, and 4 = very great extent).

During the baseline meeting, the research team delivered a presentation summarizing research on the development of intentional communication in children developing typically and those with physical disabilities. Both the DA and treatment components of TGI were described. Clinicians were given access to an online TGI training manual, which they were urged to read prior to the first training meeting. The manual provided background information about early communication development, with an emphasis on gaze, gestural, and vocal behaviors along a communication continuum (see Figure 1). The manual also presented written descriptions, case examples, and video exemplars to introduce TGI's conceptual framework and to demonstrate how to deliver the TGI protocol's essential elements.

#### **Training Phase**

The training phase consisted of two 1.5-hr meetings at the clinicians' work site, with one intervening 0.5-hr in-home practice session with a participating child.

*First training meeting.* During the first training meeting, the research team reviewed and discussed the TGI manual, including the four essential elements for the DA and treatment components. Clinicians watched videos of young children with physical disabilities producing gaze behaviors along the communication continuum. After the research team modeled delivery of each element, clinicians practiced all elements with each other, using role play, and received feedback. The meeting ended with a group discussion about their performance.

*Practice session.* Within 1 month of this first training meeting, clinicians practiced administering the TGI protocol (both DA and treatment) in pairs, with a consented child in his or her home. Clinicians brought video recordings of these practice sessions to the second training meeting for review.

Second training meeting. During the second and final training meeting, several clinicians volunteered to share portions of their practice training videos. Video review facilitated group discussion about TGI protocol elements, and research team members provided feedback about the clinicians' performance. Video review with group discussion and feedback continued until clinicians had no more questions and voiced satisfaction that they could complete a trial implementation of the TGI protocol with a second child.

#### **Trial Implementation Phase**

Following the training phase, each clinician administered the TGI protocol with a second consented child and recorded this session. In most cases, clinicians worked in pairs, with each acting as a primary administrator of the DA and treatment, while the partner recorded the session.

#### Follow-Up Phase

The follow-up phase consisted of one final 1.5-hr meeting. Clinicians' trial implementation videos were collected, and the seven clinicians who completed all study procedures anonymously completed the EBPAS. Further, the clinicians shared their experience in the project, including their views of the TGI protocol and perceptions about the feasibility of using it in practice. The benefits and drawbacks of the training, as well as suggestions for change, were discussed.

### Data Reduction and Analysis

#### Attitude

The EBPAS, administered at baseline and at followup, assessed clinician attitudes in four domains: appeal of EBP, likelihood of adopting an EBP given requirements to do so, openness to new practices, and perceived divergence of usual practice with research-based or academically developed interventions. Clinician ratings (0–4) were averaged for each domain and for a total score. For the divergence subscale, lower ratings indicate more positive attitudes; thus, reverse scoring of this scale was used when computing the total score. For all other subscales, higher ratings indicate more positive attitudes. Because of the small sample size, unequal groups, and distributional characteristics of the data, a nonparametric Wilcoxon signedranks test was used to compare the mean ratings for EBPAS total scores from baseline to follow-up.

#### Fidelity

Implementation fidelity was only examined for the administration of the DA. The two fidelity variables of adherence and competence were evaluated on the basis of clinician delivery of the DA protocol. Scores reflected delivery of the protocol's four essential elements: (a) provide opportunity, (b) recognize child behavior, (c) shape the signal toward TG, and (d) reinforce child's communicative attempt through play. The second and third authors developed and used a system to evaluate adherence and competence, on the basis of videos of the first 10 opportunities each clinician delivered during trial implementation.

Adherence. Adherence was defined as accuracy in delivering each of the protocol's four essential elements. Accuracy was judged by using dichotomous scoring. For each opportunity, a score of 1 = an element was delivered, and 0 = the element was not delivered. Table 2 presents operational definitions for the four elements and adherence scoring. Interobserver agreement for each element was examined; the percentage agreement was 97.3% (range 90.4%–100%). Disagreements were resolved by consensus. Analyzed data included agreements, as well as items resolved by consensus. Total percentage accuracy across all protocol elements was calculated as the total number of present behaviors divided by the total number of present and absent behaviors  $\times$  100. The percentage accuracy for each element of the protocol was calculated as the number of present behaviors for each element divided by the number of present and absent behaviors for each element × 100. The percentage accuracy was examined for variability in delivery of each protocol element, across clinicians, by visual inspection.

*Competence.* Competence was operationally defined as *quality* in delivering each of the four essential elements and was judged by using a 3-point rating scale: 3 = high*quality*, 2 = adequate quality, and 1 = poor quality, as presented in Table 3. Each of the clinicians' 10 DA opportunities was rated on the quality of delivery overall and for each element. Interobserver agreement for ratings of each element was examined; the percentage agreement was 76.5% (range 51.2%–84.1%). Disagreements were resolved by consensus. Analyzed data included agreements, as well as items resolved by consensus. Mean ratings were calculated for overall competency and for competency in delivery of each element of the protocol. Competence ratings were examined for variability in delivery of each protocol element, across clinicians, by visual inspection.

For each analysis described earlier, individual performance by clinician discipline was not examined for a number of reasons. First, although this research adopted an interdisciplinary approach to training, the study's primary aim was to investigate the effect of the TGI training on clinician attitude and implementation fidelity, not to examine the impact of discipline on these outcomes. Second, the small sample size and unequal distribution of clinicians across disciplines precluded such an analysis, even if attempted post hoc. Given that recruitment occurred at one center in a local community, we wished to protect the identity of our collaborators.

#### **Child Performance**

In one case, two clinicians administered a DA with the same child on two different dates for their trial implementation session. Because the clinicians achieved different degrees of fidelity in delivering the TGI protocol (see Results section), this case presented an opportunity to preliminarily explore the relationship between implementation fidelity and child performance, as measured by TG production. The first and second authors independently recorded the presence or absence of TG during the DA component of Table 2. Operational definitions for assessing accuracy in clinician delivery of the four essential elements of the TGI protocol.

Element	Clinician behavior <sup>a</sup>	Operational definition
1. Provide opportunity	Selects materials	Selects developmentally appropriate toy(s)
	Presents materials	Presents toys within child's field of vision and delivers an accompanying verbal elicitation (e.g., "Want more?" "Which one do you want?")
	Waits	Waits approximately 15 s for child to respond
2. Recognize child's behavior	Recognizes and responds to child's potentially communicative behavior	Names a gaze behavior produced by the child, from communication continuum
3. Shape	Decides to shape	If child produces triadic gaze, reinforces signal
		If child produces other behavior, shapes to a more sophisticated form on the basis of communication continuum
	Selects behavior to shape, when appropriate	Selects a gaze behavior along communication continuum, moving toward triadic gaze
	Delivers shaping prompts	Provides visual, auditory, verbal, or tactile prompts
4. Reinforce with play	Engages child in play with desired toy(s)	Gives toy or continues activity
		Presents new opportunity if no response or protest
Note. TGI = Triadic Gaze Inte	rvention.	

<sup>a</sup>Score 1 = *if present*; 0 = *if absent*.

the trial implementation videos. The first eight opportunities<sup>2</sup> were examined for Clinician 1; the first 10 opportunities were examined for Clinician 2. Interobserver agreement on the presence or absence of TG was examined; percentage agreement was 87.5% (seven of eight opportunities) for Clinician 1, and 90% (nine of 10 opportunities) for Clinician 2. Disagreements were resolved by consensus. Analyzed data included agreements, as well as items resolved by consensus. The percentage TG was calculated as the number of TG behaviors the child produced divided by the number of opportunities × 100.

## Results

#### Attitude

Mean baseline and follow-up ratings on the EBPAS are displayed in Figure 4. For the openness, appeal, and requirements subscales, higher ratings indicate more positive attitudes. For the divergence subscale, lower ratings indicate more positive attitudes; thus, reverse scoring of this scale was used to compute the EBPAS total score. Results at baseline revealed positive attitudes across all four domains (openness M = 3.3, SD = 0.45; appeal M = 3.7, SD = 0.32; requirements M = 2.9, SD = 0.83; and divergence M = 1.3, SD = 0.81). These attitudes remained high at follow-up (openness M = 3.2, SD = 0.28; appeal M =3.3, SD = 0.50; requirements M = 3.3, SD = 0.44; and divergence M = 0.7, SD = 0.60). A nonparametric, Wilcoxon signed-ranks test indicated that the mean rank for the EBPAS total score at follow-up (5.50) was greater than the mean rank at baseline (2.00), but this was not statistically significant (Z = -1.35, p = .18).

## Fidelity

#### Adherence

Figure 5 presents boxplots of clinician adherence to TGI protocol, in terms of percentage of overall accuracy and percentage accuracy in delivering each protocol element, on the basis of the first 10 DA opportunities during trial implementation. Across all clinicians, overall adherence to the TGI protocol was high; the mean accuracy score across all elements measured above 90% (M = 0.94, SD = 0.06). Accuracy for individual elements of the TGI protocol was highest for play (M = 1.0, SD = 0.06), followed by provide opportunity (M = 0.96, SD = 0.06), and then shape signal (M = 0.94, SD = 0.07). Accuracy was also high for recognize signal but showed a greater degree of variability across clinicians (M = 0.93, SD = 0.14).

#### Competence

Figure 6 presents boxplots of the competence with which clinicians administered the TGI protocol, for both overall quality and quality in delivering each protocol element. Quality of delivery was rated on a 3-point scale, with higher ratings indicating better quality. Across all clinicians, overall competence was high, with the mean overall quality rating falling above 2.0 (M = 2.5, SD = 0.35). Quality ratings for individual protocol elements were highest for play (M = 2.9, SD = 0.18), followed by provide opportunity (M = 2.6, SD = 0.36). Quality ratings for recognize signal (M = 2.3, SD = 0.57) and shape signal (M = 2.1, SD = 0.54) were lower and demonstrated a greater degree of variability across clinicians.

# Relationship Between Implementation Fidelity and Child Performance

Two of the seven clinicians conducted a trial implementation session with the same child on different dates.

<sup>&</sup>lt;sup>2</sup>Two of Clinician 1's opportunities were excluded because the child's gaze behavior was not adequately captured on video. Clinicians were instructed to position the camera to best capture their delivery of the TGI protocol's four essential elements.

	Rating				
Element	3	2	1		
1. Provide opportunity	Selects proper materials (developmentally appropriate, interesting to child) and places in child's field of vision Delivers an elicitation question or comment to make it clear that the	Some qualities missing (e.g., did not get child's attention, holds toys too high or too far apart, did not use elicitation question, short wait)	Several qualities lacking		
2. Recognize child's behavior	child is to respond Names child behavior AND responds appropriately (e.g., shapes behavior, gives toy, terminates if no response or protest)	Names child behavior OR responds appropriately	Fails to respond to child's behavior		
3. Shape child's behavior	Makes appropriate decision to shape child behavior or not	Some shaping qualities missing (e.g., question about behavior or prompt)	Several qualities lacking (e.g., does not shape and should have)		
4. Reinforce with play	Appropriately reinforces child's communicative attempt by playing with toys and keeping child engaged	Gives child toy but does not adequately play	Does not give child toy		

Table 3. Operational definitions for rating quality in clinician delivery of the four essential elements of the TGI protocol.

Discrepant overall quality ratings in these two clinicians' trial implementation performance provided an opportunity to explore the relationship between fidelity to the TGI protocol and child performance. Table 4 presents the overall accuracy scores and quality ratings for each clinician, as well as the child's corresponding percentage of TG production. Despite a high overall accuracy score (98%), Clinician 1 demonstrated a moderate overall quality rating (2.2). Clinician 2 demonstrated a similarly high overall accuracy score (100%) but a higher overall quality rating (2.8). Clinician 1 elicited one TG production across eight opportunities (12.5%). In contrast, Clinician 2 elicited 10 TG productions across 10 opportunities (100%). Thus, when working with the same child, the clinician with the higher quality rating (Clinician 2) elicited more TG

productions than the one with the lower quality rating (Clinician 1).

## Discussion

Moving external evidence-based protocols into routine clinical practice is a challenging process involving several stages, each of which must be investigated deliberately and systematically. This pilot study was a first step, investigating one early stage of implementation: training clinicians to deliver the empirically supported TGI protocol, in the context of their early intervention work setting. As is typical in early intervention service delivery, clinicians from multiple disciplines come together to plan and deliver treatment. This research provided the opportunity to recruit and train



Figure 4. Clinician ratings on the Evidence-Based Practice Attitude Scale (EBPAS) at baseline and follow-up.

Feuerstein et al.: TGI Implementation: Clinician Attitude and Fidelity 1293

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**Figure 5.** Clinician adherence, as measured by percentage of accuracy in clinicians' delivery of the four essential elements of the TGI protocol, during a trial implementation session.



clinicians from multiple disciplines, which allowed us to examine implementation of the DA protocol in an authentic practice setting. The research explored two aspects of implementation: change in clinician attitude about the evidence and fidelity in delivering the protocol. The relationship between fidelity and child outcomes was also explored. The training approach was based on prior research but adapted to meet the clinicians' needs. The meetings and training sessions were designed to be practical for working clinicians, yet sufficient to teach the TGI protocol. Results provided insight into moving this protocol into practice,

**Figure 6.** Clinician competence, as measured by quality in delivery of four essential elements of the TGI protocol, during a trial implementation session.



yielding valuable information regarding the implementation process.

#### Attitude

Clinicians are major stakeholders in the implementation process. Their attitudes about integrating external evidence into practice influence the likelihood of evidence being adopted, and ultimately sustained, in routine service delivery. At baseline, clinicians reported positive attitudes about integrating external, research-based evidence into their routine practice, and these attitudes remained high at follow-up. These results suggest that the short installation (two meetings and two training sessions) was sufficient to satisfy clinicians that they could adopt the TGI protocol. The positive attitudes may also reflect characteristics of these particular clinicians. From the 29 eligible clinicians who attended the project's initial informational meeting, nine initially self-selected to participate, and seven completed all phases of the study. These seven clinicians may represent a unique subset who maintain more open and positive attitudes about integrating research into practice than the larger population of practitioners.

Clinician attitudes remained high overall from baseline to follow-up, but ratings on the divergence subscale of the EBPAS demonstrated an interesting and important trend. This subscale examines the extent to which clinicians perceive research-based interventions as not clinically useful and less important than clinical experience. Lower ratings on divergence items, therefore, indicate more positive attitudes toward embracing external evidence. Ratings on all items from this subscale decreased from baseline to follow-up. Although the small sample size did not permit formal statistical analyses, this trend suggested that clinicians' attitudes about external, research-based interventions improved following training on the TGI protocol. Thus, clinicians may have felt that the protocol was more aligned with their clinical practice routines than initially expected. This trend is encouraging, as it suggests that even with this select sample of clinicians who were already open to research-based evidence, the experience of participating in this pilot implementation study may have positively affected their attitudes about integrating such evidence into their early intervention practice. These results suggest that clinicians with positive attitudes may quickly discover the value of adopting external evidence into practice and may require less support to do so in training. Such clinicians ultimately might serve as ambassadors for embracing the adoption of empirically supported protocols into practice. On the other hand, clinicians with less positive attitudes may require more support to see the value of such evidence, and training may need to more directly address this challenge. Further exploration of the relationship between clinician attitude and implementation fidelity is warranted, particularly with a sample of clinicians having greater variability in their attitudes about adopting empirically supported protocols into practice.

1294 Journal of Speech, Language, and Hearing Research • Vol. 60 • 1285–1298 • May 2017

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Clinician	Implementation fidelity		Child performance			
	% overall accuracy	Overall quality	Number of opportunities coded	Number of triadic gaze productions	% triadic gaze	
A	100	2.8	10	10	100.0	
В	98	2.2	8	1	12.5	

Table 4. Relationship between clinician fidelity to the TGI protocol and child performance.

## Implementation Fidelity

When examining implementation fidelity, both adherence to and competency in delivering a protocol's essential elements are critical to measure. In this study, fidelity was examined for delivery of the DA protocol. Results demonstrated that a relatively short training was successful in teaching overall adherence to the DA protocol and competence in delivery of some of its elements. These results are encouraging; however, discrepancies between these ratings raise the question of how best to teach the protocol. Training clinicians to accurately deliver protocol elements may require different techniques than training to highquality delivery of each element. That is, adherence and competence may need to be considered separately, as results suggest that training one does not guarantee success with both. For example, teaching clinicians to accurately judge whether a child attempted to produce a communication behavior may be amenable to self-study, with multiple video exemplars of different behaviors across different children. In contrast, teaching clinicians to competently identify which behavior from the communication continuum a child produced in the context of play may require a different approach altogether. This latter skill may require coaching clinicians in the moment and assisting them in recognizing children's subtle, fleeting communicative attempts. Differences in accuracy versus quality outcomes suggest that clinician training may need to mirror child treatment: different techniques may be required to accomplish different behavioral objectives. This area of implementation science clearly warrants further investigation.

In addition to discrepancies between adherence and competence, results also revealed discrepancies within quality. In particular, quality ratings were lower overall and more variable for some protocol elements (recognize signal, shape signal) than others (provide opportunity, reinforce with play), consistent with previous TGI training research (Olswang et al., 2006). Thus, some essential elements of the protocol have proven more difficult to learn than others. For example, providing structured communication opportunities and reinforcing play appear to be routine and, therefore, easily accomplished parts of early intervention practice. In contrast, recognizing signals and shaping appear to be more challenging, particularly when working with young children with physical disabilities. Clinicians may know to look for potentially communicative behaviors and shape them to more conventional,

sophisticated signals; however, quality delivery of these elements with children with physical disabilities requires accurate reading of potentially communicative behaviors, which can be difficult (Sigafoos et al., 2000). Training competent delivery of such elements may require increased attention, perhaps including direct coaching with immediate feedback as each clinician interacts with a child. This is important to consider in light of the potential relationship between clinician quality and child outcomes, discussed in the following.

## Implementation Fidelity and Child Performance

The relationship between implementation fidelity and child performance was preliminarily explored for one pair of clinicians who delivered the DA protocol to the same child. Both clinicians demonstrated a high degree of accuracy in delivering the protocol, but quality differed between the two. The clinician with higher quality ratings elicited more TG productions from the child than the clinician with lower quality ratings. These results suggest that competence in delivering the protocol's essential elements may affect child performance on the target behavior. The current research was not designed to address the validity of the DA for documenting actual level of child TG performance; however, the data offer a glimpse into the potential relationship between implementation fidelity and child performance. Of course, future studies examining this relationship would require an appropriate research design and adequate experimental control, as discussed in the following.

## Value of Implementation Research

The process of moving external, evidence-based protocols into clinical practice requires that researchers approach implementation as rigorously as efficacy research. Researchers need to examine variables that can influence implementation, which, in turn, can affect the effectiveness of research-based protocols as they are used in practice. The implementation process is complex, involving a multitude of variables from clinicians to organizational policies. This pilot study explored an early step in the implementation process, specifically, clinician training during the installation stage. This systematic examination of clinician attitude and fidelity of protocol delivery provided new insights into approaching the implementation process and understanding the TGI protocol in the context of an early intervention practice setting. The present data suggest that following training, clinicians' attitudes about adopting EBP improved. Recognizing the similarities and differences between an empirically supported protocol and current practice can assist researchers in promoting clinician buyin, as they introduce new protocols and advocate for their adoption. Thus, the current finding is viewed as a positive indicator for moving the TGI protocol into practice.

Fidelity findings suggest that although clinicians were relatively successful at learning to implement the protocol's essential elements accurately, performance quality was more variable. These results clearly indicate the need to revise the present training approach overall and for each element. The ultimate goal is to design a training that is not only effective but also efficient. A variety of training strategies should be explored to improve learning of each essential element. Recognizing differences among the elements in the context of implementation has been valuable for better understanding the protocol and possible threats to its validity in practice. As researchers, the fidelity findings suggest that the training process is more complex than originally envisioned, and additional study is required.

### **Limitations and Future Directions**

This study provides preliminary data on the impact of clinician attitudes and implementation fidelity on how the DA component of TGI was implemented in one clinical practice setting. Some of the limitations of this research lead to intriguing topics for future research, not only for moving the TGI into practice, but also for examining implementation of other empirically supported protocols. First, variability in quality ratings (vs. accuracy scores) of delivering empirically supported protocols in real practice settings is a topic of considerable interest. In this study, higher competence in delivering the DA protocol's essential elements would be expected to better support a child in producing a new behavior or skill not previously accomplished. This expectation aligns with the current study's preliminary results: the more competent clinician performance elicited better child performance, suggesting that specific focus on quality in clinician training may indeed result in better child outcomes. Although we documented differences in quality between two clinicians, as they assessed the same child and, in turn, observed differences in child performance, the findings must be viewed with caution. As acknowledged earlier, the design of the study did not permit systematic evaluation of the relationship between clinician fidelity (adherence or competence) and child performance. A number of uncontrolled variables may have contributed to the difference in this child's performance with the two clinicians, for example: the number and type of toys used, the order and type of opportunities presented, and the seating and positioning support provided. Future research should systematically investigate the impact of these and other variables that support a clinician's ability to competently deliver the DA protocol.

A second area for future investigation relates to early intervention service delivery. Children with physical disabilities often receive cotreatment by professionals from different disciplines. Although three of the seven clinicians worked in pairs to deliver the DA protocol, this aspect of the training and trial implementation was not examined. In particular, the role of peer observation during training of empirically supported protocols could be a valuable direction in future implementation research.

In addition, this research used a traditional workshop approach to training TGI and documented that clinicians were able to learn the four essential elements of the DA protocol. A host of questions remain regarding which training techniques are most effective to support clinicians in reaching high implementation fidelity for different protocol elements. Perhaps a more effective and efficient approach to training would be to use various training techniques for the different elements. For example, training clinicians to provide opportunities and play might be easily accomplished via illustrative video clips. In contrast, recognizing and shaping signals, which appeared more difficult to learn, might require more intense training with additional examples, opportunities to practice, and even coaching. This area of implementation science clearly warrants further investigation.

### **Concluding Remarks**

Enthusiasm for moving empirically supported protocols into practice is high, but the ease of doing so is hardly simple or straightforward. If researchers ultimately wish to translate their evidence to practice for achieving desired outcomes, they will be well served by attending to the implementation process. This path of investigation is ripe with questions, all of which will reward researchers with a deeper understanding of their evidence-based protocols and new insights into the likelihood of those protocols being adopted and achieving their desired effects.

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