

Title: Caregiver Fidelity: What can we learn from a Caregiver-Mediated Intervention for Toddlers with ASD?

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Introduction: Caregiver-mediated intervention for children with Autism Spectrum Disorder (ASD) is often seen as a way to increase exposure to early intervention strategies delivered at high fidelity. Understanding the role of competency, through intervention fidelity, can help us better understand the benefits of caregiver-mediated intervention. The types of skills and strategies caregivers use before training can play an important role in their ability to utilize caregiver training. However, few studies track baseline data of parent strategies (Ruppert, et al., 2016). Following and reporting on the maintenance of fidelity after training is relatively uncommon (Barton, et al., 2013; Patterson, et al., 2012). The current study examines parent strategy use throughout the course of intervention to determine factors related to strategy implementation, maintenance, and child outcomes.

Method: 86 toddlers with ASD and their primary caregiver participated in a RCT that randomized dyads to receive either parent education or individualized parent coaching in caregiver-mediated JASPER (Joint Attention, Symbolic Play, Engagement, and Regulation) (Kasari, et al., 2015). Intervention was conducted over 10 weeks with one hour of caregiver-therapist contact weekly. Additionally, all families were concurrently enrolled in the same 30-hr per week early intervention classroom.

Use of JASPER strategies were coded from a 10-minute parent-child interaction (PCX) taped in clinic with a standard set of toys (Kasari, et al., 2015; Gulsrud et al., 2016). The strategies coded were environment, imitation, pacing/direction, communication, and prompting. The presence or absence of each strategy was coded in 2-minute intervals, yielding a percentage score between 0 and 1. Scores across the different strategies were averaged to provide a total fidelity score between 0 and 1. Reliability was established (ICC minimum of 0.86). A high or low fidelity group based on a median split of total fidelity scores at entry was created. Cognitive and behavioral measures were used to characterize groups at entry, and Initiations of Joint Attention (IJA) and Behavior Regulation (IBR) coded from the Early Social Communication Scales (ESCS), total play acts from the Structured Play Assessment (SPA), and engagement state coded from the PCX were used to examine child outcomes.

Linear Mixed Models (LMMs) were used to describe the interactions between parent fidelity group, time, and intervention group on the outcomes of individual strategy use and child behaviors throughout the course of the study. Random intercepts to account for within-subject variability across timepoint and covariates of chronological age and MSEL IQ to control for potential confounding influences were included. T-tests were used to determine whether there were group differences in the high and low fidelity groups at entry in parent and child characteristics. LMM and LQMM analysis was conducted in R (R Core Team, 2013) using the lme4 package (Bates, et al., 2015), while t-tests were conducted with SPSS.

Result: Parents' range of fidelity scores at entry was from 0.2 to 0.7, and the high fidelity group had significantly higher entry total scores (mean= 0.547, SD= 0.08 p=0.001). Of the JASPER strategies, the higher group had higher scores in imitation (p=0.000) and prompting (p=0.007). Across entry child and parent characteristics, the higher fidelity parents had children with significantly less IJA acts (mean= 1.69, SD= 2.6, p=0.019) and lower MSEL IQ scores (mean=63.69, SD=16.46, p=0.004),

LMMs describing parent strategies from Entry to Exit revealed that all strategies had a positive treatment by time effect as previously reported in Gulsrud, et al. (2016), but Pace/Direction ($\beta = -0.210, SE = 0.66, p = 0.002$), Prompting ($\beta = -0.121, SE = 0.61, p = 0.05$), and Imitation ($\beta = -0.181, SE = 0.07, p = 0.000$) additionally had a time by fidelity group effect, where the lower group improved at a higher rate over time. Both fidelity groups in the JASPER group reached high levels of fidelity at exit. LMMs describing the maintenance effect from Exit to Follow-Up revealed that Imitation, Communication, and Prompting had a treatment by time effect ($\beta = -0.190, SE = 0.05, p = 0.002, \beta = 0.593, SE = 0.062, p = 0.015, \beta = 0.611, SE = 0.05, p = 0.04$), where the treatment group decreased its strategy use at a higher rate to return to entry-level strategy scores.

LMMs for child outcomes revealed that there was a three-way treatment by time by fidelity group effect on duration of joint engagement ($\beta = -85.13, SE = 39.86, p = 0.033$), with those children with lower fidelity parents in the JASPER group making the greatest gains. Additionally, there were entry to exit time by fidelity group ($\beta = 0.120, SE = 2.25, p = 0.000$) and treatment by fidelity ($\beta = 8.33, SE = 3.04, p = 0.007$) effects on IBR, with the high fidelity group having a higher improvement rate over time and in both treatment groups.

Discussion: This work shows that revisiting the assumptions of caregiver-mediated interventions is warranted. We confirmed that parents enter into an intervention study with a considerable range of skills but with hands on support can be trained to high levels of fidelity during the intervention. After a short term intervention, some parents likely continue to need varied levels of support. Additionally, we found that those with the highest levels of JASPER strategies at entry also had the children with the lowest expressive language abilities and the lowest frequencies of IJA

acts. Last, the link between fidelity and child outcome, though promising in the case of joint engagement, is less clear for other child outcomes.

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