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Cognitive Flexibility and Theory of Mind Outcomes Among Foster Children: Preschool Follow-up Results of a Randomized Clinical Trial

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Abstract

Young children who experience early adversity are at risk for problems regulating emotions, behavior, and physiology, which in turn place them at risk for later psychopathology, school problems, and peer relation difficulties. Early parenting interventions are therefore critical in helping this vulnerable population develop adequate self-regulatory capabilities. Attachment and Biobehavioral Catch-up (ABC) is an intervention developed to help parents learn to behave in ways that enhance young children's self-regulatory capabilities. In the present study, we found that preschool-aged foster children who had received the ABC intervention showed stronger cognitive flexibility and theory of mind skills, relative to foster children who had received a control intervention. Foster children who had received the ABC intervention showed capabilities in these areas that were not significantly different from a comparison group of children who were never in foster care. These findings are promising in suggesting that the ABC intervention enhances the development of foster children's self-regulatory capabilities.

Keywords

Parenting; attachment; early intervention; preschool; foster care; cognitive flexibility; theory of mind; executive function

Young children who have experienced early caregiving adversity, including parental neglect and foster care, represent a vulnerable population at risk for developing problems regulating emotions, behavior, and physiology. These regulatory deficits are evident in the elevated rates of externalizing problems observed in foster children, such as hyperactivity, impulsivity, inattention, aggression, non-compliance, and peer relation problems (Clausen, Landsverk, Ganger, Chadwick, & Litrownik, 1998; Heflinger, Simpkins, & Combs-Orme, 2000; Simmel, Brooks, Barth, & Hinshaw, 2001). Such difficulties are suggestive of deficits in higher order cognitive processes, including executive function and theory of mind skills. Indeed, past research suggests that early adversity is associated with deficits in executive functioning, emotion understanding, emotion regulation, and theory of mind capabilities

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(Curtis & Cicchetti, 2007; Lewis, Dozier, Ackerman, Sepulveda-Kozakowski, 2007; Pears & Fisher, 2005; Pears, Fisher, Bruce, Kim, & Yoerger, 2010). Effective early intervention programs aimed at improving the quality of the parent-child relationship among foster dyads may provide protection against these long-term self-regulatory deficits.

During early childhood, young children develop increasingly sophisticated strategies for regulating their own emotions and behavior (Hughes & Esnor, 2007). Executive functioning refers to higher order cognitive processes that aid in the monitoring and control of emotions and behavior, which include holding information in working memory, inhibiting impulses, planning, sustaining attention amidst distraction, and flexibly shifting attention in order to achieve goals (Blair, Zelazo, & Greenberg, 2005; Carlson, 2005). Theory of mind, defined as the ability to understand that others may have different emotions and motivations from one's own and that these inner states influence what people do (Carlson & Moses, 2001), also develops considerably across early childhood (Hughes & Ensor, 2007). Executive function and theory of mind skills are moderately correlated, even when controlling for verbal abilities (Carlson & Moses, 2001; Hughes, 1998; Hughes & Ensor, 2007; Muller, Zelazo, & Imrisek, 2005). These skills are integral for children's successful adjustment to the academic, behavioral, and social competence demands encountered when they begin school (Blair, 2002; Capage & Watson, 2001; Hughes, Dunn, & White, 1998; Riggs, Blair, & Greenberg, 2003).

Both executive function and theory of mind abilities develop rapidly between the ages of 3 and 6 years, timing that coincides with a period of rapid growth of the prefrontal cortex (Diamond, 2002; Hongwanishkul, Happaney, Lee, & Zelazo, 2005). Age-related changes in the prefrontal cortex during this period include both increases in grey and white matter volume and in inter-hemispheric connectivity (Matsuzawa et al., 2001; Pfefferbaum et al., 1994; Thompson et al., 2000). Neuroimaging and event-related potential studies suggest that both executive function and theory of mind capabilities are to some extent dependent on prefrontal cortex functioning, in coordination with other brain areas such as the hippocampus and the amygdala (Casey, Giedd, & Thomas, 2000; Poggi Davis, Bruce, Snyder, & Nelson, 2003; Sabbagh & Taylor, 2000; Schulz et al., 2005).

Foster care placement increases the risk for later correlates of executive function deficits, such as symptoms of inattention and hyperactivity, disruptive behavior disorders, and academic problems (Clausen et al., 1998; Heflinger et al., 2000; Lawrence, Carlson, & Egeland, 2006; Lewis et al., 2007; Pears, Heywood, Kim, & Fisher, 2011). Additionally, foster children show deficits in theory of mind (Pears & Fisher, 2005), which may contribute to the peer relation difficulties often seen in this population (Leve, Fisher, & DeGarmo, 2007). Such deficits may reflect changes to biological systems brought about by early life stress (Tarullo & Gunnar, 2006). In particular, preschool-aged foster children tend to show altered hypothalamic-pituitary-adrenal (HPA) system functioning, often characterized by a lower, flatter pattern of diurnal cortisol production, relative to comparison children (Bernard, Butzin-Dozier, Rittenhouse, & Dozier, 2010; Fisher, Van Ryzin, & Gunnar, 2011; Gunnar & Vazquez, 2001). Such irregularities in diurnal cortisol production, in turn, may have damaging effects on the developing brain, particularly in the hippocampus, amygdala, and prefrontal cortex regions, brain areas associated with executive function and theory of mind (Graham, Heim, Goodman, Miller, & Nemeroff, 1999; Gunnar & Vazquez, 2001; McEwen, 1998; Sapolsky, 1996).

Attachment and Biobehavioral Catch-up Intervention

Responsive caregiving early in life (i.e., parental sensitivity, secure attachment, and frequent, coordinated social attention) has been associated with children's later self-

regulatory, executive function, and theory of mind abilities (Kochanska, Murray, & Harlan, 2000; Stams, Juffer, & van IJzendoorn, 2002; Wellman, Phillips, Dunphy-Lelii, & LaLonde, 2004). The Attachment and Biobehavioral Catch-up (ABC) intervention is a 10-session, manualized parenting program aimed at enhancing young children's self-regulatory capacities by helping caregivers provide nurturing and synchronous care. These two intervention components (i.e., nurturance in response to child distress, and synchronous parent-child interactions) are targeted in a number of ways. Interventionists describe the importance of providing nurturing and synchronous care, based on developmental research. Additionally, interventionists videotape parent-child interactions during structured activities designed to help caregivers practice being synchronous by "following the child's lead." Interventionists provide feedback using video clips that highlight times when caregivers interacted with their children in nurturing and synchronous ways versus times when they struggled to do so (e.g., directing or teaching, intruding on the child's space, or being passive and disengaged). Finally, interventionists help caregivers consider how their own early experiences (e.g., not receiving nurturing care themselves) may make it more difficult to provide nurturing and synchronous care to their children.

The efficacy of the ABC intervention has been assessed in randomized clinical trials with both foster and high-risk birth parents. Notably, children randomly assigned to the ABC intervention showed lower rates of disorganized attachment than children assigned to a control intervention (Bernard et al., 2012; Dozier et al., 2009). Enhancing rates of organized attachment seems particularly important, given associations between disorganized attachment and self-regulatory difficulties (Fearon, Bakermans-Kranenburg, van Ijzendoorn, Lapsley, & Roisman, 2010). Children who received the ABC intervention also showed more normative cortisol production than those who received the control intervention (Dozier, Bernard, Bick, & Gordon, 2012; Dozier et al., 2006; Dozier, Peloso, Lewis, Laurenceau, & Levine, 2008). These results are exciting in demonstrating the power of a relatively brief parenting intervention to affect both behavioral and biological functioning of at-risk children.

The present study is a follow-up of a subset of children whose parents previously participated in a randomized trial of the ABC intervention when children were infants and toddlers. We examined executive function and theory of mind when children were preschoolers.

Method

Participants

Participants included 61 children (50.8% male), between the ages of 4–6 years old (M = 60.3 months; SD = 8.6 months). Of these, 37 had histories of foster care placement prior to the age of three years (M age at first placement = 4.2 months; SD = 9.3 months). Prior to age 20 months, foster children were randomly assigned to receive the ABC intervention or (n = 17) or a control intervention (n = 20). Post-intervention, foster children were assessed annually through the age of six years. Comparison children (n = 24), who had never been in foster care, were recruited through their prior participation in a separate research study (Sumner, Bernard, & Dozier, 2010).

Children included in the sample were ethnically diverse (42.6% African American; 36.1% European American; 21.3% Hispanic, Asian American, or Biracial). All of the parents in the sample were female and 57.4% of parents were European American, 39.3% were African American, and 3.3% were Asian American. All except one of the parents (1.6%) had earned at least the equivalent of their high school diploma (42.6%), and many had additionally attained an associate's or bachelor's degree (32.8%) or a post-graduate degree (23.0%).

Most parents were married (70.5%), with the remaining parents indicating their relationship status as: single, never married (13.1%); divorced or separated (6.6%); dating or living together (4.9%); or widowed (4.9%). The mean annual income of families in the study was $78,425 (*SD* = $53,176).

Among the foster children (*n* = 37), most had been adopted or reunited with birth parents (94.6%; *n* = 35), at a mean age of 19.9 months (*SD* = 13.2 months). By age 4–6 years, 21 children were placed with foster parents who had adopted them (56.8%); 11 were placed with biological relatives who had adopted them (29.7%); three had been reunited with biological parents after a history of foster care (8.1%); and two were placed with foster parents who had not adopted them (5.4%). All children had been initially placed into foster care either due to caregiver neglect, parental psychopathology, or parental incarceration. Most had been initially placed into foster care within the first month of life (64.9%), with the remaining children having been placed into foster care between the ages of 1.5 and 12 months (24.3%), or between the ages of 15 and 36 months (10.8%). On average, children had been placed with their current caregivers at 7.5 months old (*SD* = 10.9 months). More than half of the children had experienced a single, stable placement (54.1%), with the remaining children having experienced two (27.0%) or three (18.9%) placement changes prior to the current placement.

Procedure

At an initial home visit, research staff attained consent and parents completed a background information questionnaire. Additionally, research staff administered the theory of mind (5 minutes) and receptive vocabulary (20 minutes) assessments. At a subsequent laboratory visit, the cognitive flexibility (5 minutes) task was administered.

Measures

Cognitive Flexibility—The Dimensional Change Card Sort (DCCS; Zelazo, 2006) was used to provide an index of preschool executive function. The DCCS is an experimenter-administered task in which children are asked to sort a series of cards (e.g., red rabbits and blue boats) into separate piles first according to one dimension (color; “pre-switch”) and then, after completing six trials, according to the other dimension (shape; “post-switch”). Most 3-year-olds perseverate by continuing to sort according to the first dimension, despite being reminded to sort by the second dimension at every new trial. Children’s performance on the DCCS improves with age and correlates positively with other measures of executive function and theory of mind (Carlson & Moses, 2001; Hongwanishkul et al., 2005). The measure has also been found to differentiate children diagnosed with clinical disorders characterized by executive function deficits, such as ADHD and autism, from healthy controls (Mulas et al., 2006; Zelazo, Jacques, Burack, & Frye, 2002). Following task guidelines, children were credited one point for every card they sorted correctly. Children’s pre-switch scores ranged from 0 to 6 (*M* = 5.75; *SD* = 1.1), as did their post-switch scores (*M* = 4.2; *SD* = 2.6).

Theory of Mind—The Penny-hiding game (Oswald & Ollendick, 1989) was administered to assess children’s theory of mind abilities. Children’s scores on the Penny-hiding game at three years old have been shown to correlate moderately with their scores one (*r* = .40) and two years later (*r* = .35; Hughes & Ensor, 2007). The task has been shown to be developmentally sensitive and to distinguish between autistic, mentally retarded, and control children (Oswald & Ollendick, 1989). To administer this task, the researcher placed both hands behind her back and hid a penny in one hand. Both closed hands were then shown to the child and the child was asked to guess in which hand the penny was hidden. Three demonstration trials were presented, and then the child was asked to hide the penny for three

test trials. For each of the test trials, the child earned one point each for: hiding both hands behind his or her back, presenting both hands to the researcher for guessing, and keeping the penny concealed at all times. Across the full sample, children's scores on the task ranged from 1 to 9 ($M = 7.9$; $SD = 2.0$).

Pre-Natal Risk Indices—Parents provided information regarding three pre-natal risk factors: premature birth (i.e., birth at less than 37 weeks gestation); low birth weight (i.e., birth weight of less than 2500 grams); and prenatal drug exposure (i.e., exposure to any illegal drugs or alcohol during the pregnancy). Each of these three individual risk factors was scored as present or absent, and summed into a cumulative pre-natal risk index for each child, as suggested by Burchinal, Roberts, Hooper, and Zeisel (2000). Pre-natal risk indices were missing for 13 foster children whose parents were unsure of whether the child experienced a specific risk factor.

Receptive Language Abilities—The Peabody Picture Vocabulary Test–Third Edition (PPVT-III; Dunn & Dunn, 1997) was used to assess child receptive language abilities. The PPVT-III is a standardized assessment, during which children are presented with four pictures and asked to point to the picture of a stated word. In the present study, standard scores on the PPVT-III ranged from 70 to 142 ($M = 107.1$; $SD = 15.4$).

Parent Psychopathology and Recent Life Stress—Parents completed the Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983), which consists of 53 items rated on a 5-point scale. Scores on the global severity index were utilized as a measure of current parent psychopathology. Overall, scores ranged from 33 to 80, with a mean of 48.3 ($SD = 11.0$). Parents also completed the Life Experiences Scale (LES; Sarason, Johnson, & Siegal, 1978) as an index of recent life stressors. Parents indicated whether any of the events (e.g., "marriage," "death of a relative") occurred within the past six months and whether they were experienced as "bad," "good," or "neutral." The total score (sum of positive, negative, and neutral events) was utilized as an estimate of recent life stressors, with scores ranging from 0 to 18 ($M = 4.2$; $SD = 4.3$).

Results

Preliminary Analyses

Children in the foster care control (FCC) group were younger than children in the non-foster comparison (NFC) group, $F(1, 42) = 10.87$, $p = .00$. Additionally, the composition of the groups differed significantly with regard to both child gender, χ^2 (2, $N = 61$) = 8.92, $p = .01$, and child ethnicity, χ^2 (4, $N = 61$) = 15.21, $p = .00$. Specifically, the ABC group was comprised of a greater number of girls (76.5%), whereas the NFC group was comprised of a greater number of boys (70.8%). Moreover, the FCC group was predominantly comprised of African American children (70.0%), whereas the ABC and NFC groups included greater proportions of European American children (41.2% and 58.3%, respectively). However, there were no significant gender or ethnicity differences in children's cognitive flexibility or theory of mind scores, p 's > .05 However, there were significant group differences in parent education, $F(2, 58) = 27.44$, $p = .00$, and family income, $F(2, 58) = 9.57$, $p = .00$, with parents in the NFC group reporting attaining a higher level of education and earning a higher annual income relative to ABC and FCC parents. Additionally, parents who had received the ABC intervention reported earning a higher annual income than FCC parents, $F(1, 35) = 7.48$, $p = .01$. Parent education and family income were highly correlated, $r = .62$, $p = .00$; thus, a single socio-economic status (SES) composite variable was created by summing the z-scores of these two variables.

The ABC and FCC groups differed significantly from the NFC group with regard to the pre-natal risk index, $F(2, 45) = 9.71$, $p = .00$, which appeared driven by foster children having been more likely to experience prenatal drug and alcohol exposure, relative to NFC children, χ^2 (2, $N = 61$) = 25.40, $p = .00$. However, the proportion of children who had been born prematurely, χ^2 (2, $N = 57$) = 1.82, $p = .40$, and/or at a low birth weight, χ^2 (2, $N = 48$) = 3.68, $p = .16$, did not differ significantly by group. The ABC and FCC groups did not differ significantly from each other in terms of the individual pre-natal risk factors or overall pre-natal risk index, p's > .05. Also, the pre-natal risk indices were not significantly associated with the cognitive flexibility or theory of mind outcomes, p's > .05.

Children in the NFC group attained higher receptive language scores than ABC children, $F(1, 39) = 6.32$, $p = .02$, and the FCC children, $F(1, 42) = 12.58$, $p = .00$. However, these group differences did not hold when controlling for SES, p's > .05. The groups did not differ significantly with regard to current parental psychopathology, $F(2, 58) = 0.19$, $p = .83$. Parents in the ABC group reported experiencing significantly more recent life events relative to the NFC group, $F(1, 39) = 6.50$, $p = .02$. However, only child age, child receptive language scores, and family SES composites were significantly correlated with one or both of the study dependent variables (r's ranging from .28–.44, p's < .05). Further analyses were therefore initially conducted controlling for these three variables. However, when included in the main analyses with child receptive language scores, child age and family SES were no longer significantly associated with the dependent variables; thus, child receptive language scores was the only variable included as a covariate in all following analyses.

Main Analyses

To examine differences in children's cognitive flexibility, a 2 × 3 repeated measures analysis of covariance (ANCOVA) was conducted, controlling for child receptive language scores. Task Type (pre-switch, post-switch) was the within-subjects factor, Group (ABC, foster care control, non-foster comparison) was the between-subjects factor, and children's performance on the cognitive flexibility task was the dependent variable. As shown in Figure 1, results of the ANCOVA revealed a significant main effect of Group, $F(2, 59) = 5.24$, $p = .008$, with FCC children performing worse, overall, on the tasks relative to ABC and NFC children. A significant interaction between Task Type and Group was also found, $F(2, 59) = 3.63$, $p = .03$, such that FCC children attained significantly lower scores on the post-switch card sort, relative to the ABC group and to NFC children, but not on the pre-switch card sort, $p > .05$.

The within- and between-subjects variables in the model accounted for approximately 14.5 and 22.7 percent of the variance in the outcome, respectively, with Group accounting for approximately 14 percent of the between-subjects variability ($\eta^2 = .14$) and the Task Type by Group interaction accounting for approximately 11 percent of the within-subjects variability ($\eta^2 = .11$). Follow-up contrasts using a Bonferroni-adjusted critical value were conducted to control for Type I error inflation. Effect sizes are reported as Cohen's d statistic, representing a standardized estimate of the magnitude of the observed group differences. Results showed that children in the ABC group ($M = 5.00$, $SD = 2.03$) scored higher than children in the FCC group ($M = 2.40$, $SD = 2.87$) on the post-switch task ($M_{contrast} = 1.31$, $p = .00$, CI $_{95}$: 0.35, 2.27), and the effect size for this contrast was large ($d = 1.06$). Children in the ABC group did not differ significantly from children in the NFC group ($M = 5.08$, $SD = 2.02$) in terms of their post-switch scores ($M_{contrast} = -0.21$, $p = 1.00$, CI $_{95}$: −1.14, 0.71). However, children in the FCC group scored significantly lower on the post-switch task than children in the NFC group ($M_{contrast} = -1.52$, $p = .00$, CI $_{95}$: −2.40, −0.64), and the effect size was large ($d = 1.12$).

To examine differences in children's theory of mind task performance, a between subjects univariate ANCOVA was conducted controlling for child receptive language scores. Group (ABC, foster care control, non-foster comparison) was the independent variable and children's performance on the theory of mind task was the dependent variable. Transformed values of the theory of mind scores were used to correct for the negatively skewed sampling distribution. Results of the ANCOVA revealed a significant main effect of Group on theory of mind, $F(2, 59) = 4.59$, $p = .01$, when controlling for child receptive language scores (See Figure 2). The independent variables predicting theory of mind accounted for 17.4 percent of the variance, with Group accounting for approximately 13 percent ($\eta^2 = .14$) of the variance in the outcome.

Contrasts using a Bonferroni-adjusted critical value showed that children in the ABC group ($M = 8.76$, $SD = 0.44$) scored higher than children in the FCC group ($M = 6.80$, $SD = 2.51$) on the theory of mind task ($M_{contrast} = 1.96$, $p = .01$, CI $_{95}$: 0.49, 3.44), and the effect size for this contrast was large ($d = 1.08$). Relative to NFC children ($M = 8.17$, $SD = 1.71$), children in the ABC group did not differ significantly in their theory of mind scores ($M_{contrast} = 0.60$, $p = .90$, CI $_{95}$: −0.81, 2.01), but children in the FCC group scored *marginally* lower than children in the NFC group ($M_{contrast} = -1.37$, $p = .05$, CI $_{95}$: −0.02, −2.72).

Discussion

Preclinical and human studies alike suggest that the developing brain is vulnerable to the effects of early caregiving adversity (Charney, 2004; De Bellis, 2005; Gunnar & Cheatham, 2003; Sanchez, Ladd, & Plotsky, 2001). Perhaps related, young children in foster care often develop problems regulating emotions, behavior, and physiology (Fearon et al., 2010; Fisher et al., 2011). The ABC intervention was designed to target specific issues that are especially salient for young children who have experienced early foster care placement. This intervention was previously found to effectively promote the development of young children's secure/organized attachments to caregivers (Bernard et al., 2012; Dozier et al., 2009) and to enhance their physiological regulation (Dozier et al., 2006, 2008, 2012).

The present study further suggests that the ABC intervention supports normative development of executive function and theory of mind capabilities by preschool age, outcomes important for school adjustment and social competence (e.g., Pears et al., 2010). These results highlight the potential of a relatively brief parenting intervention to improve the self-regulatory capabilities of young foster children by increasing nurturing parental care and synchronous interactions within parent-child dyads. Although a limitation of this study is the small sample size and the inequality of the three groups on several demographic variables, our results remained significant when controlling for demographic differences and intervention effects were detected despite the small sample. These results provide preliminary support for the long-term efficacy of the ABC intervention approximately two years post-intervention. Our findings suggest the importance of early intervention for young children in foster care and demonstrate the potential protective power of enhancing the parent-child relationship in terms of young foster children's development of self-regulatory capabilities.

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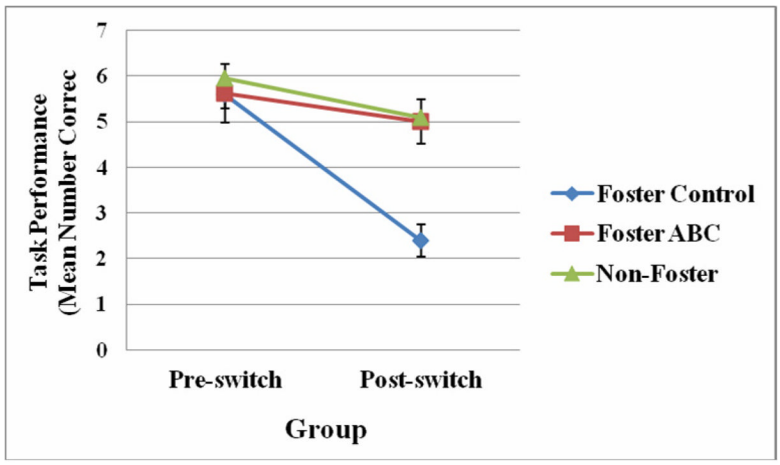

Figure 1.
Child cognitive flexibility task performance by Task Type (Pre-switch, Post-switch) and Group (Foster Care Control, Foster ABC, Non-Foster Comparison). Error bars represent standard error of the mean.

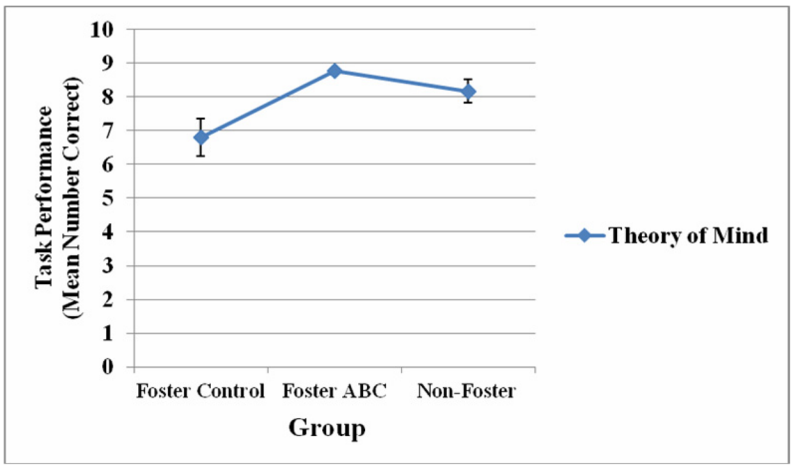

Figure 2.
Child theory of mind task performance by Group (Foster Care Control, Foster ABC, Non-Foster Comparison). Error bars represent standard error of the mean.