

# American Journal on Intellectual and Developmental Disabilities

## Reducing Depressive Symptoms among Latina Mothers of Autistic Children: An RCT

--Manuscript Draft--

<b>Manuscript Number:</b>	AJIDD-D-23-00050R1
<b>Article Type:</b>	Research Report
<b>Keywords:</b>	autism spectrum disorder; Latina mothers; depressive symptoms; parent education; RCT
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<b>Manuscript Region of Origin:</b>	UNITED STATES
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## Reducing Depressive Symptoms among Latina Mothers of Autistic Children: An RCT

**Abstract**

This study examines the intervention effect of a culturally tailored parent education program in reducing depressive symptoms among Latina mothers of autistic children. In this two-site randomized waitlist-control study ( $n = 109$  mother-child dyads), a peer-to-peer mentoring (promotora) model was used to deliver an intervention that was designed to increase mothers' self-efficacy and use of evidence-based strategies. We assessed mothers' depressive symptom (CES-D) scores at three time points and used linear mixed models to determine whether their scores significantly changed from baseline to post-intervention (Time 2) and sustained at four months post-intervention (Time 3). Results show that mothers in the intervention group reported a significant decrease in mean depressive symptom scores at Time 2 and that the effect was maintained at Time 3 with intermediate to medium effect sizes. There were no differences in results across sites. Findings suggest that [name withheld], a culturally tailored intervention led by peer mentors, showed a significant effect both immediately after the intervention and four months post-intervention in reducing depressive symptoms among Latina mothers of autistic children.

*Keywords:* autism spectrum disorder (ASD), autistic, Latina mothers, depressive symptoms, parent education, randomized control trial (RCT)

## Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disability that affects a child's development with manifestations in areas including restricted interests, repetitive behaviors, and challenges in social skills, speech, and nonverbal communication (American Psychiatric Association, 2013). Furthermore, autistic individuals may present other conditions, including specialized or focused behaviors, attention-deficit/hyperactivity disorder, disrupted sleep, obsessive-compulsive behavior, anxiety, and depression (Centers for Disease Control and Prevention [CDC], 2022; Grondhuis & Aman, 2017; Peters-Scheffer et al., 2012). To be more inclusive of autistic perspectives, we use both person-first and identity-first language. We use person-first language when referring to the condition and services, and identity-first when referring to autistic individuals.

There has been a marked increase in ASD prevalence in recent years. It now affects one out of every 36 children in the United States (Maenner et al., 2023). Studies have highlighted significant racial/ethnic disparities in identifying and diagnosing autistic children, especially for Latino children who have historically been underdiagnosed (Angell et al., 2018; Magaña & Vanegas, 2021; Nevison & Zahorodny, 2019). However, the most recent CDC Autism and Developmental Disabilities Monitoring (ADDM) Network analysis found that the prevalence of ASD among Latino children surpasses White children (Maenner et al., 2023). Another study assessed changes in early ASD identification over time and reported similar results (Shaw et al., 2022). While these findings suggest improvements in diagnosing autistic children from racially and ethnically minoritized backgrounds, Latino children are still less likely to receive services than non-Latino White children (Bishop-Fitzpatrick & Kind, 2017; Magaña et al., 2013; Smith et al., 2020). Research suggests that ASD service disparities are a consequence of systemic barriers,

including language difficulties, transportation challenges, limited health coverage/financial resources, fewer options for child/respite care, lower quality of care, and racial/cultural bias in service systems (Blanche et al., 2015; Iland et al., 2012; Magaña et al., 2012; Singh & Bunyak, 2019; Zuckerman et al., 2014; Zuckerman et al., 2017).

Research shows that mothers of autistic children are at risk for elevated psychological stress and poorer social functioning when compared to mothers of neurotypical children (DePape & Lindsay, 2015; Estes et al., 2009; Estes et al., 2013; Hayes & Watson, 2013; Vasilopoulou & Nisbet, 2016) or children with other types of developmental disabilities (Dabrowska & Pisula, 2010; Hayes & Watson, 2013; Valicenti-Mcdermott et al., 2015). Manifestations of ASD including specialized or focused behaviors are often more pronounced and complex for parents to manage (Willis et al., 2016), leading to increased stress, sleep deprivation, and fatigue (Eisenhower & Blacher, 2006; Vasilopoulou & Nisbet, 2016). In addition, the stigma of having an autistic child and reduced opportunities for community engagement due to increased caregiving responsibilities may also contribute to parental stress and anxiety (Kuusikko-Gauffin et al., 2013; Vasilopoulou & Nisbet, 2016).

Research on depressive symptoms of Latina mothers of children with intellectual and developmental disabilities (IDD) have shown mixed results. In a study of families of adults with IDD, Magaña and colleagues (2004) found that Latina mothers had more health issues, and had higher levels of depressive symptoms compared to non-Latina White mothers. Another study found that Latina mothers of children with intellectual disability were significantly more distressed (depressive and somatic symptoms) and slightly higher levels of global distress compared to non-Latina White mothers (Long et al., 2015). However, other studies on families of autistic individuals found that Latina mothers exhibit lower levels of stress (Hickey et al.,

2021; Magaña & Smith, 2006). In addition, it is well-documented that Latina mothers of autistic children are more likely to experience language and cultural barriers, less social support, fewer socioeconomic resources, as well as poorer access to healthcare systems and other services compared to their non-Latina White counterparts when seeking diagnostic and ASD-related services (Blacher et al., 1997; Blacher & McIntyre, 2006; Eisenhower & Blacher, 2006; Iland et al., 2012; Magaña et al., 2006; Zuckerman et al., 2014). These challenges could potentially lead to high levels of stress and depression.

A substantial body of literature recognizes the importance of cultural relevance when developing interventions (Castro et al., 2010; Parra Cardona et al., 2012). Strategies for developing culturally relevant interventions include linguistic, contextual, and cultural elements of the target population. Research suggests that culturally responsive evidence-based interventions are especially beneficial for Latina mothers of children with IDD. For example, studies have found limited knowledge about autism and disability among immigrant Latino families due in part to limited healthcare access and disability awareness in their countries of origin (Magaña et al., 2013; Magaña et al., 2015). Consequently, interventions could be designed to expand Latina mothers' knowledge about their child's conditions and to help increase access to related services and social support. However, it is unclear how increased parental knowledge, self-efficacy, access to services, and social support may be related to improving parental well-being among Latina mothers.

The present study examines the efficacy of a culturally tailored intervention in reducing depressive symptoms among Latina mothers of autistic children. The intervention, [name withheld for peer review], is a peer-led parent education program that incorporates the eight domains of the ecological validity framework by Bernal and colleagues (1995) (i.e., language,

persons, metaphors, content, concepts, goals, methods, and context) for the purpose of ensuring feasibility, acceptability, and cultural relevance to the Latino population (citation withheld). We developed [name withheld] in collaboration with a community advisory committee (CAC) consisting of key community partners, including Latino parents of autistic children, staff from a Parent Training and Information Center, and professionals who served Latino autistic children (a pediatrician and a social worker). The research team met regularly with the CAC members and as a result, we were able to incorporate their feedback directly into the study design, intervention delivery, and evaluation.

A crucial aspect of the intervention was the use of the Promotora de Salud model (CDC, 2019). Promotoras are lay health educators and members of local Latino community, and therefore share social, cultural, and economic characteristics with other members of their community. In [name withheld], our promotoras were also Latina mothers of autistic children. This identity added another dimension of shared experiences, which further enabled the promotoras to gain trust, relate to, and support the participants (Magaña et al., 2014). This is important, as previous research has consistently highlighted the importance of social support in alleviating the impact of stressors related to caring for a child with neurodevelopmental disabilities (Drogomyretska et al., 2020; Meadan et al., 2010; Mercado et al., 2021).

Another important aspect of the intervention was its intentional design to increase parental self-efficacy (PSE) leading to behavioral change (use of evidence-based strategies with their children). Research shows that PSE contributes to better outcomes for both the parents and the child. For parents, studies found that PSE is associated with lower depression and higher satisfaction with the parenting role (Jones & Prinz, 2005). For children, PSE have shown to be a protector against developmental delay in children who live in low-resource family environment

(McDonald et al., 2016). To promote self-efficacy, we specifically designed our intervention to foster these key elements: (a) mastery – understanding the needs of the child, offering knowledge on the disability and ways to address symptoms through role-plays and home activities; (b) vicarious experiences – providing opportunities to learn from personal experiences of the promotoras; (c) verbal persuasion – sharing success stories and modeling examples of changes; and (d) healthy psychological state – providing ways and resources for maintaining emotional well-being (Bandura, 1977). Previously, we reported that our intervention significantly increased Latina mothers' self-efficacy and use of evidence-based strategies, and the intervention effects were maintained at four months post intervention (citations withheld). In the present analysis, we tested whether receiving the intervention would decrease maternal depressive symptoms. Our research questions were as follows:

1. Do mothers in the intervention group report lower depressive symptoms compared to mothers in the control group between baseline and immediately post intervention (Time 2)?
2. Do mothers in the intervention group report lower depressive symptoms compared to mothers in the control group between baseline and four months post intervention (Time 3)?

Based on our theoretical framework, we hypothesized that Latina mothers of autistic children would experience a significant decrease in depressive symptoms upon completion of the intervention (Time 2). We also hypothesized that the intervention effect would be maintained at four months post intervention (Time 3).

## **Methods**

### **Study Design**

A two-site randomized waitlist-control trial (RCT) was implemented to examine the immediate and longer-term intervention effects of [name withheld] (citation withheld). Institutional review boards at both sites [university names withheld] reviewed and approved the study. The two study sites were major cities in California and Illinois, both of which were characterized by large Latino immigrant populations at the time of the study (Pew Research Center, 2016). The RCT and its associated data collection procedures lasted three years from December 2014 to December 2017. Data collections were performed at three time points: baseline, post-intervention (Time 2; roughly four months after baseline since the intervention program lasted 14 weeks), and four months post-intervention (Time 3; approximately eight months after baseline). We used a random number generator to assign participants to intervention and waitlist-control conditions. Participants learned about their random assignments after baseline assessment was conducted – participants in the intervention groups received the intervention immediately after being randomized, while those in the waitlist-control groups did not receive the intervention until the participants had completed all assessments.

### **Participants**

To recruit participants, we collaborated with local community agencies and schools that served Latino families of children with disabilities. We also contacted local parent support groups for families of children with disabilities. Families learned about the study via the bilingual (English and Spanish) study brochures sent through social media, email listservs, newsletters, and in paper format. We contacted parents who expressed interest to screen for eligibility. Families were eligible if (a) they lived in the geographic areas of one of the two study sites; (b) self-identified as Latino/a or of Latin American descent; (c) had at least one child with a documented ASD diagnosis or were at risk for ASD. A small number of children were waiting

to be diagnosed with ASD at baseline. To confirm their eligibility, we administered the Modified Checklist for Autism in Toddlers (M-CHAT) scale (Robins et al., 1999) and recruited them if they scored 3 or greater; and (d) the child was eight years old or below at the time of enrollment. While both fathers and mothers were encouraged to participate, only mothers went through the intervention program and the three assessments because all families indicated that the mother was the primary caregiver of the autistic child.

Figure 1 shows the enrollment and retention of participants during the study. In total, 127 families were eligible after telephone screening. Eighteen families were lost to follow-up before randomization for various reasons (11 lost interest, five were unable to be contacted, and two withdrew for personal reasons). The remaining 109 families completed informed consent and baseline assessment and were subsequently randomized into intervention ( $n = 54$ ) and waitlist-control ( $n = 55$ ) conditions. After completing intervention, nine mothers in the intervention group were lost to follow-up due to outstanding personal or family needs (e.g., severe illness or family emergency in another country), and three were unable to be contacted after repeated attempts, while only one mother was lost to follow-up in the control groups. A total number of 96 families completed Time 2 assessment (intervention  $n = 42$ , control  $n = 54$ ). At four months post-intervention (Time 3), one mother in the intervention group and two in the control group were lost to follow-up. As a result, 93 families completed all three assessments (intervention  $n = 41$ , control  $n = 52$ ).

## **Procedures**

### ***Intervention Delivery and Promotoras Training***

The Promotores de Salud model (CDC, 2019) was used for intervention delivery. Promotoras in this study were required to be a Latina mother or female family caregiver of an

autistic child, fluent in Spanish (either monolingual or bilingual English/Spanish) and have demonstrated leadership in supporting other families (e.g., volunteering in a support group, providing navigational or educational support). We first developed two sets of bilingual (English and Spanish) intervention manuals – one for the promotoras and the other for the participating families. The promotora manual consisted of 14 weekly sessions and detailed instructions for the promotoras, along with activities, video clips for demonstrations, and a list of relevant local resources for Latino families of autistic children. The participant manual had the same content except without the instructions for the promotoras. All promotoras were screened and interviewed for eligibility before they were trained. In total, 16 promotoras were recruited – ten in Illinois and six in California, and all received more than 30 hours of extensive training in a group format. The training was conducted by core research staff and covered all content in the curriculum. Using interactive activities (e.g., role-play), promotoras were given the opportunity to model the curriculum and practice with each other. After completing the training, promotoras began the intervention sessions with assigned families via home visits. Promotoras were compensated for the time spent in training and delivering the intervention.

### *[Name withheld] Curriculum*

The [name withheld] curriculum was culturally tailored to meet the needs of Latino families from low-resource households. The intervention program consisted of 14 weekly in-home sessions that aimed to help parents better understand core ASD characteristics, learn about evidence-based (EB) strategies for improving social communication and daily functioning of the child, empower parents through advocacy training, facilitate social support, and address caregiver stress and depression. The weekly sessions' topics were as follow: (1) introduction to the intervention, (2) social communication in child development, (3) ASD diagnosis and the

relevance to their child's needs, (4) EB strategies to support autistic children, (5) effective advocacy skills, (6) advocacy in schools, (7) the importance of play for autistic children, (8) creating opportunities to improve communication, (9) the art of interacting with others and making friends, (10) understanding specialized or focused behaviors, (11) responding and addressing specialized or focused behavior, (12) ways to recognize and reduce parental stress and depression, (13) encouraging conversation about autism and building social support, and (14) review of the program and future planning. After each session, parents were instructed to complete a home activity to practice what they had learned during the session. For example, after session 7, parents were encouraged to use EB strategies to engage their child in an uninterrupted play session (citation withheld).

### ***Data Collection***

Following parent consent, trained graduate assistants contacted the families to conduct the baseline assessment. Soon after the baseline assessment, families who were assigned to the intervention groups were contacted by the promotoras to receive the weekly in-home sessions. Those who were in the waitlist-control groups continued to receive their routine care, which may include typical services for autistic children (e.g., speech/occupational therapies) through their usual service providers. All families were contacted for the follow-up assessments four months post-baseline assessment (Time 2) and four months after Time 2 (Time 3). Families in the waitlist-control groups received the intervention after they had completed all the assessments.

### **Measures**

Demographic information was collected at baseline. Family demographic questions included age, education level, annual household income, country of origin, employment, marital status, and self-rated health status. Child demographic questions included age, gender, and ASD

symptom severity. Mothers reported all demographic information for themselves and on behalf of their children, with the measurement of child ASD symptom severity as the only exception, which was measured by the Childhood Autism Rating Scale, 2<sup>nd</sup> edition (CARS-2; Schopler et al., 2010). The CARS-2 was administered by an experienced research staff who scored based on recorded mother-child play interactions during the baseline assessment. The CARS-2 is a 15-item scale measuring ASD symptomatology across five domains, including social, emotional, adaptive, communicative, and cognitive functioning. Items are rated on a 4-point Likert-type scale. All individual items were summed to produce a total score for each child, which could range from 15 to 60. The children's ASD symptom severity was categorized into "minimal to no symptom" (total score < 30), "mild to moderate symptoms" ( $30 \leq \text{total score} \leq 36$ ), and "severe symptoms" (total scores > 36). The Cronbach's alpha for the CARS-2 scale at baseline was 0.83, indicating good internal consistency for the current sample. The CARS-2 was only used at baseline as a demographic variable but not as an outcome.

For our outcome of interest, maternal depressive symptoms, we used the Center for Epidemiologic Studies Depression Scale (CES-D) Scale (Radloff, 1977). The CES-D is a 20-item scale that measures the frequency of depressive symptoms experienced by caregivers over the last week. Symptoms could include poor sleep, loss of interest, sadness, fatigue, and feeling lonely. Items are rated on a 4-point Likert-type scale ranging from 0 "rarely or none of the time (less than one day)" to 3 "most of all of the time (5-7 days)". A total score is calculated by summing the 20 individual items. Total scores could range from 0 to 60, with higher scores indicating greater depressive symptoms. A cutoff score of 16 or above is generally used as an indicator of clinical depression (Lewinsohn et al., 1997). The CES-D scale has been translated and validated in Spanish (Ruiz-Grosso et al., 2012). In our study, the Cronbach's alpha for the

CES-D scale at baseline was 0.89, indicating good internal consistency for the current sample. The mothers' self-report CES-D scores were collected at all three time points.

### **Statistical analysis**

We used the CONSORT 2010 checklist (Schulz et al., 2010) when writing our study report. All statistical analyses were performed using SPSS version 27.

### ***Sample Size Calculation and Power Analysis***

In our original study protocol, the *a priori* power analysis showed that a minimum sample of 44 families in each arm would be able to provide excellent statistical power ( $\geq 90\%$ ) to detect 25% changes in mean differences between intervention and control conditions, for overall medium-to-large effect sizes ( $0.5 \leq d < 0.8$ ) in primary outcomes at the two-sided 0.05 significance level. Our overall sample size exceeded the original estimation. In fact, the *posteriori* effect size approximates our power calculation: *Cohen's d* was 0.47 between baseline and Time 3 for the outcome of interest (CES-D). Although the effect size for CES-D was slightly smaller than the preset 0.5–0.8 threshold, we believe that our analytical model is robust given the larger sample size and the more stringent power threshold ( $\geq 90\%$ ) in our original study protocol.

### ***Descriptive Analysis***

Descriptive statistics including means, standard deviations, and percentages were calculated for both family and child demographic variables (see Table 1). These variables were compared across groups and sites to test if there were any pre-existing differences at baseline. The between-group and between-site comparisons were made using independent sample *t*-tests for continuous variables (e.g., mother and child ages) and chi-squared ( $\chi^2$ ) tests for categorical variables (e.g., maternal education and child gender). To test for non-random attrition, we also compared both mother and child demographic characteristics for those who dropped out.

### ***Intervention Effects and Analyses***

Our study employed a two-site experimental design with multiple time points data collection. This brought several challenges to our analysis because the data were clustered, multilevel, and nested within subjects in nature. Additionally, we needed to address the missingness resulting from participant nonresponse and attrition. As such, we used linear mixed models to provide a robust analysis for our study. Specifically, we first used the MI (multiple imputation) command in SPSS to generate pooled results to address missingness, which also aligned with the intention-to-treat (ITT) analysis. With pooled results, we then used the MIXED command with an unstructured covariance structure to account for the unbalanced data. Three main effects were examined: group assignment (intervention vs. control), time (three levels – baseline, Time 2, and Time 3), and group X time interaction (intervention effects). For linear mixed models using the MIXED command, SPSS used restricted maximum likelihood (REML) method by default (UCLA Institute for Digital Research and Education, n.d.) to provide least-biased estimates for the main effects of group, time, and group X time interaction. Control and baseline were selected as the reference categories. We included a random intercept for each subject and added the binary site variable (California vs. Illinois) as the level II fixed effect to account for the multilevel data structure. We included the binary maternal education variable as a covariate because it was at borderline significance when compared between-group and between-site (see Results section for justification). Finally, to compare intervention differences between-group and across-time, we conducted additional analyses with pairwise comparisons using Bonferroni adjustment. We calculated and reported mean differences, standard errors, *p*-values and associated effect sizes (*Cohen's d*), and 95% confidence intervals (CIs) by each combination

of group and time using the least significant difference (LSD; equivalent to no adjustment) method.

## Results

### Descriptive Statistics and Comparisons

Table 1 shows the demographic information of the 109 enrolled families at baseline. One intervention and three control families had more than one autistic child, which makes the total number of children enrolled in the study 113 (intervention  $n = 55$ , control  $n = 58$ ). On average, Latina mothers were 36.9 years old. Most mothers (86%) were first-generation immigrants, with the majority (83%) born in Mexico, and were from low socioeconomic backgrounds. About 70% of the mothers were married or partnered, and 60% rated their health as “good” or “excellent”. The autistic children were on average 5.2 years old, and about 36% were assessed to have severe ASD-related symptoms.

As shown in Table 1, none of the demographic variables at baseline showed statistically significant differences between intervention and control groups and across sites. However, maternal education was at borderline significance both between-group ( $\chi^2 = 3.04$ ,  $p = 0.08$ ) and between-site ( $\chi^2 = 2.75$ ,  $p = 0.09$ ), thus, we included this variable as a covariate in our linear mixed models. Although the differences were not statistically significant, higher percentages of mothers had high school or less education in the control groups (78% in control vs. 63% in intervention) and at the Illinois site (75% in Illinois vs. 59% in California). About half (48%, 52 out of 109) of the mothers were assessed to be at risk for depression (CES-D scores  $\geq 16$ ) at baseline. There were no statistically significant differences in mean CES-D scores at baseline, nor did we find any signs of non-random attrition based on comparisons between-group and across-site.

### **Intervention Effect in Primary Outcome**

Table 2 shows the overall linear mixed model statistics. Our linear mixed models showed that: (a) the intervention effect (group X time interaction) was significant ( $F_{[2, 195]} = 3.39, p = 0.036$ ), indicating that the intervention program showed an overall significant intervention effect for Latina mothers at both Time 2 and Time 3, and (b) the intervention effect did not differ across the two study sites ( $F_{[1, 108]} = 1.81, p = 0.181$ ).

Table 3 shows the changes in mean CES-D scores between-group and associated pairwise comparisons across the three time points. Results showed that, after Bonferroni adjustment, Latina mothers in the intervention group reported statistically significantly lower CES-D scores at both Time 2 and Time 3 than those in the control group. On average, mothers in the intervention groups reported a decrease of 3.9 points (95% CI = 0.7–7.1,  $p = 0.017$ ) in mean CES-D scores at post-intervention (Time 2) when compared to baseline with an intermediate effect size (*Cohen's d* = 0.37). This trend continued at four months post-intervention (Time 3), and the mothers reported an even steeper decrease of 5.0 points (95% CI = 1.8–8.2,  $p = 0.002$ ) in mean CES-D scores at Time 3 when compared to baseline. The respective effect size (*Cohen's d*) also increased to 0.46. In contrast, mean CES-D scores for mothers in the control group remained relatively stable with no statistically significant changes across the three time points. Figure 2 illustrates the changes in mean CES-D scores between intervention and control groups across time points.

### **Discussion**

The present study examines the efficacy of a psychoeducational program in reducing depressive symptoms among Latina mothers of autistic children. To observe the change, data were collected at three time points, before the intervention (baseline), immediately after the

intervention (Time 2), and four months post-intervention (Time 3). We adopted a peer-mentoring (promotoras) model to deliver the intervention.

Consistent with our first hypothesis, we found that the mothers in the intervention group reported a reduction in depressive symptoms between baseline and Time 2, while the control group did not. Furthermore, the results did not vary across the two sites. It is important to note that our previous analysis of the [name withheld] study found variation across sites in family outcomes and child social communication (citation withheld). We believe that site variation in these measured outcomes was due to the distinctive healthcare systems and health policies in California and Illinois and that these differences have affected the number of services available to the families (Lopez, 2014; citation withheld). Our current study suggests that the differences in healthcare systems and health policies between the two states did not affect the overall result in CES-D scores among the mothers across sites. This implies that [name withheld]'s culturally tailored content and the method of delivery may be key to reducing depressive symptoms among Latina mothers of autistic children.

There were two components of the intervention that we believe to have contributed to the overall intervention effect. The first component was the use of the promotora model in intervention delivery. Throughout the intervention, mothers have consistently received culturally meaningful content and social support from the promotoras. Based on past literature on the importance of social support and utilizing such support as a form of coping strategy among Latina mothers of children with IDD, we believe that our promotoras have helped the mothers' overall psychological well-being (Magaña et al., 2014; Willis et al., 2016). The second component was our intervention design. We had intentionally developed our intervention with Bandura (1977)'s key elements of self-efficacy (mastery, vicarious experiences, verbal

persuasion, and healthy psychological state) and incorporated culturally relevant components. The success of the intervention may be due to the unique design that aimed to promote self-efficacy leading to behavioral changes in evidence-based parenting strategies, which in turn, likely improved parenting satisfaction. The findings from our previous study are consistent with research on the relationship between self-efficacy and behavioral change (Bandura, 1977; Chong & Kua, 2017; Erdwins et al., 2001; citation withheld).

Consistent with our second hypothesis, we found that the intervention effect at four months post-intervention has not only maintained, but the scores of depressive symptoms have continued to decrease from Time 2 to Time 3. The sustained effect in this study reflected our original study findings that showed sustained intervention effects in parental self-efficacy and use of EB strategies with their child even at four months after the intervention (citation withheld). Additionally, [name withheld] reported that the use of child services has not only sustained but increased at four months after the intervention. Our previous findings showed that throughout and after the intervention, mothers learned to navigate the service systems with the help from the promotoras, who themselves have experienced similar challenges. Successfully navigating the service systems and advocating for their child may, in turn, alleviate their psychological distress and lead to improved overall well-being.

There are some limitations to the study that need to be acknowledged. First, although CES-D is one of the most widely used brief scales for assessing depressive symptoms, its self-reporting nature could induce social desirability. To minimize this problem, future studies should seek to incorporate both a self-report and a clinical measure for assessing depressive symptoms. Second, analyses of contextual variables, including service availability, systemic barriers, and

state funding at mezzo and macro levels, should be included in future studies to comprehensively understand how these factors contribute to the mothers' overall psychological well-being.

Despite these limitations, our findings highlight the importance and efficacy of a culturally tailored intervention towards improving maternal outcomes among Latina mothers of autistic children. Our findings build on limited autism research finding that parent-mediated interventions can not only improve parent behavior and child outcomes, but can also contribute to positive mental health among caregivers (Feinberg et al., 2014).

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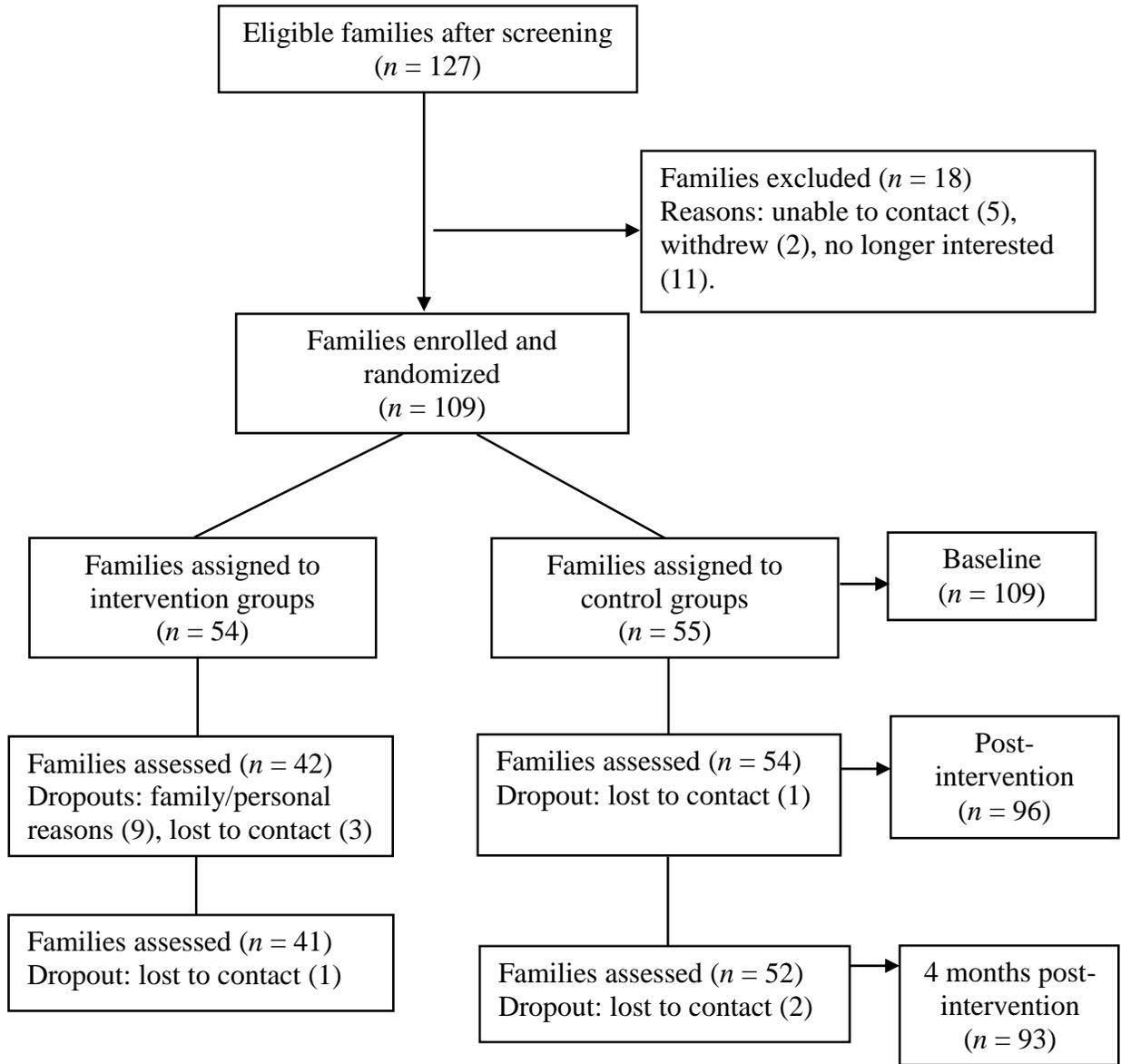
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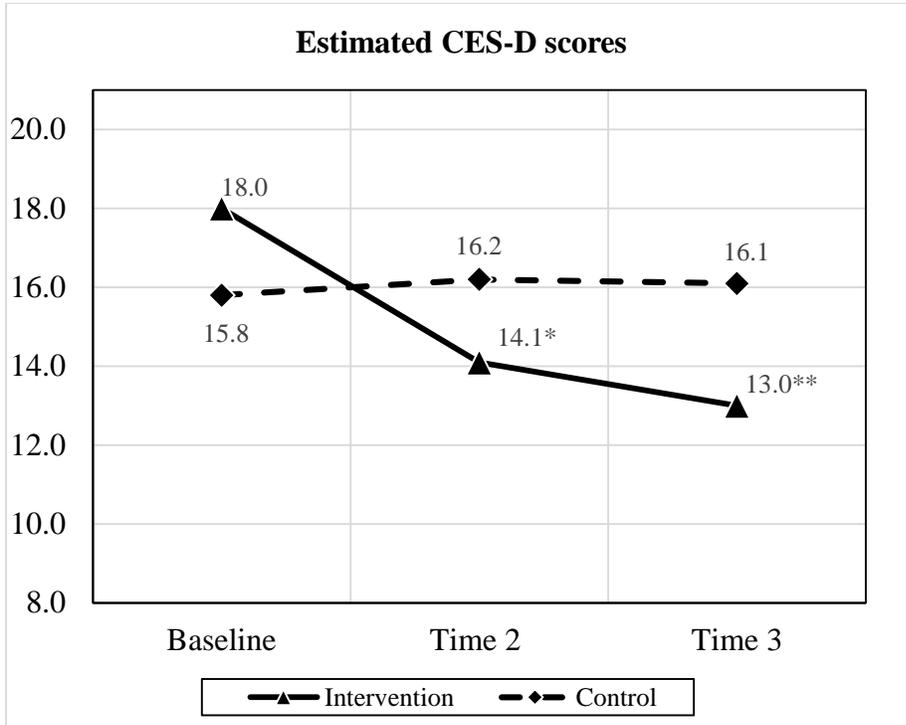
**Figure 1**

*Enrollment and Retention Flowchart*



**Figure 2**

*Estimated Mean CES-D Scores Between-group and across Time Points*



*Note.* The estimated CES-D mean scores were adjusted by maternal education level.

**Table 1**  
*Demographic Characteristics at Baseline*

<b>Characteristics</b>	<b>Total (n = 109)</b>	<b>Intervention (n = 54)</b>	<b>Control (n = 55)</b>	<b>p-values<sup>c</sup></b>
<b>Parent</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	
Age	36.9 (6.3)	37.3 (6.1)	36.6 (6.5)	0.60
	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>	
Education level				0.08
High school or less	77 (70.6)	34 (63.0)	43 (78.2)	
Some college or above	32 (29.4)	20 (37.0)	12 (21.8)	
Annual household income <sup>a</sup>				0.23
\$19,999 USD or less	35 (33.3)	19 (37.3)	16 (29.6)	
\$20,000-\$39,999 USD	52 (49.5)	21 (41.2)	31 (57.4)	
\$40,000 USD or more	18 (17.1)	11 (21.6)	7 (13.0)	
Employed	32 (29.4)	12 (22.2)	20 (36.4)	0.11
Married or living with partner <sup>a</sup>	77 (71.3)	41 (75.9)	36 (66.7)	0.29
Foreign-born	94 (86.2)	44 (81.5)	50 (90.9)	0.15
Health status <sup>a</sup>				0.31
Good or excellent	65 (60.7)	29 (55.8)	36 (65.5)	
Poor or fair	42 (39.3)	23 (44.2)	19 (34.5)	
Study site				0.87
Illinois	80 (73.4)	40 (74.1)	40 (72.7)	
California	29 (26.6)	14 (25.9)	15 (27.3)	
<b>Characteristics</b>	<b>Total<sup>b</sup> (n = 113)</b>	<b>Intervention<sup>b</sup> (n = 55)</b>	<b>Control<sup>b</sup> (n = 58)</b>	<b>p-values<sup>c</sup></b>
<b>Child</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>Mean (SD)</b>	
Age	5.2 (1.8)	5.3 (1.8)	5.2 (1.8)	0.77
	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>	
Male	98 (86.7)	46 (83.6)	52 (89.7)	0.35
ASD symptom severity (CARS-2) <sup>a</sup>				0.77
minimal to no symptom	38 (34.5)	18 (34.0)	20 (35.1)	
Mild to moderate symptoms	32 (29.1)	14 (26.4)	18 (31.6)	
Severe symptoms	40 (36.4)	21 (39.6)	19 (33.3)	

*Notes:*

SD=standard deviation; USD=US dollars; ASD=autism spectrum disorder; CARS-2=childhood autism rating scale (2<sup>nd</sup> edition).

<sup>a</sup> There were missing data due to incomplete responses: income ( $n = 105$ ), marital status ( $n = 108$ ), health status ( $n = 107$ ), and ASD symptom severity ( $n = 110$ ).

<sup>b</sup> One family in intervention and three in control groups had more than one child with ASD.

<sup>c</sup>  $p$ -values were produced by independent sample  $t$ -tests for continuous variables (e.g., parent age) and  $\chi^2$  tests for categorical variables (e.g., income).

**Table 2***Linear Mixed Model Statistics*

Sources	Type III fixed effects			
	Numerator	Denominator	F statistics	p-values
	df	df		
<b>Intercept</b>		108.76	257.96	<0.001
Time <sup>a</sup>	2	195.36	2.48	0.086
Intervention <sup>a</sup>	1	109.09	0.34	0.563
Time*Intervention <sup>a</sup>	2	195.31	3.39	0.036*
Site <sup>a</sup>	1	108.16	1.81	0.181

*Note.* df = degrees of freedom.

<sup>a</sup> Levels of fixed effects variables: time (baseline, Time 2, and Time 3), intervention (intervention, control), site (California, Illinois).

**Table 3**

*Changes in CES-D Scores and Pairwise Comparisons across Time*

Outcome	Intervention			Control				
	Baseline	Time 2	Time 3	Baseline	Time 2	Time 3		
CES-D Scores	Mean (SE) <sup>a</sup>	18.0 (1.5)	14.1 (1.7)	13.0 (1.7)	15.8 (1.5)	16.2 (1.5)	16.1 (1.5)	
	95% CI <sup>a</sup>	[15.0, 21.0]	[10.9, 17.4]	[9.7, 16.3]	[12.8, 18.7]	[13.3, 19.2]	[13.1, 19.0]	
Group	Pairwise comparisons	Mean	SE	df	<i>p</i> -values <sup>b</sup>	95% CI	<i>Cohen's d</i> <sup>c</sup>	
assignment	difference							
Intervention	Baseline	Time 2	3.9	1.61	205.76	0.017*	[0.7, 7.1]	0.37
		Time 3	5.0	1.63	204.46	0.002**	[1.8, 8.2]	0.46
Control	Baseline	Time 2	-0.5	1.45	190.34	0.742	[-3.3, 2.4]	-0.04
		Time 3	-0.3	1.47	191.54	0.834	[-3.2, 2.6]	-0.03

*Note.* SE = standard error; df = degrees of freedom; CI = confidence interval.

<sup>a</sup> Means, standard errors, and 95% confidence intervals were adjusted by maternal education level.

<sup>b</sup> *p*-values were adjusted by Bonferroni adjustment.

<sup>c</sup> *Cohen's d* was calculated with reference to baseline CES-D scores.