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Improving Parental Stress Levels Among Mothers Living with HIV: A Randomized Control Group Intervention Study

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Abstract

Limited knowledge exists regarding parenting efficacy interventions for mothers living with HIV (MLH). This study evaluated the impact of a supportive group intervention on lowering parenting stress among MLH. Eighty MLH were randomized to a parenting (N = 34) or health focused (control) (N = 46) group intervention. Pre- and post-intervention stress levels were assessed using the Parental Stress Index-Short Form (PSI/SF). Differences in PSI/SF scores were examined using ANOVA, and predictors of PSI/SF scores were evaluated using multivariable linear regression. Findings indicate that both groups experienced significant decreases in parenting stress from baseline to post-intervention ($p = 0.0001$), with no significant differences between interventions. At baseline, 41% of participants were identified as highly stressed and 30% as clinically stressed, with PSI/SF scores above the 85th and 90th percentile, respectively. Amongst the highly stressed subpopulation, significant improvements in PSI/SF scores for Parental Distress PSI/SF ($p = 0.039$), Difficult Child PSI/SF ($p = 0.048$), and total PSI/SF ($p = 0.036$) were seen, with greater improvements in the parenting intervention. Among the clinically stressed subpopulation, significant improvements in total post-intervention PSI/SF scores were seen ($p = 0.049$), with greater improvements in the parenting intervention. Results indicate that screening for high levels of stress should be considered in clinical practice to effectively implement stress-reducing interventions among MLH.

Introduction

Women represent a rapidly growing group of individuals living with HIV/AIDS in the US[1,2] with the majority being of child-bearing age.[3] Mothers living with HIV (MLH) are likely to serve as primary caregivers for their children,[4] and as the proportion of MLH trends upward, it is essential to understand how factors affecting parenting efficacy may influence outcomes for children of MLH.[3,5] Factors associated with HIV+ serostatus among MLH include drug and alcohol use, having multiple children, single parenthood, low education, lack of financial resources, depression, and lack of social support,[6–9] with all of them having the potential to contribute to increased maternal stress among MLH.[3,10,11] Compromised parenting efficacy may result from such stressors, which may adversely impact the health and development of children of MLH. [12–14]

Murphy et al. showed maternal stress to be associated with less effective parenting practices in MLH, which in turn predicted problematic behavior in their children.[12] Kotchick et al. examined relationships between parenting variables and child psychosocial outcomes among inner-city African American mothers who differed by HIV status.[13] Findings suggest that interventions targeting parenting efficacy of MLH have the potential to enhance the mother–child relationship, leading to decreased maternal stress and improved child outcomes.[13] The authors argue that targeted parenting skills interventions can be highly beneficial for all mothers, but should be imperative for MLH.[2,13] While the adverse effects of stress on MLH are well recognized, evidence is lacking for effective strategies to reduce parenting related stress.

Recognizing the need for maternal stress reduction in MLH, and the dearth of existing resources, two behavioral interventions were developed that each aimed to reduce stress among MLH; one that addressed the general stressors associated with being HIV-infected, and the other specifically addressing the stressors inherent in parenting young children while also managing their HIV disease.[5] The study was

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conducted in the Southern US where stigma and socioeconomic disparities, two potent stressors for MLH,[5,15] are highly prevalent. To balance the need for supportive interaction among this socially isolated population with the formidable psychosocial and logistical barriers they face, group interventions were delivered[5] that provided the benefits of helping individuals cope with their HIV disease by facilitating adjustment efforts, teaching coping strategies, and fostering networks that are rich in social support.[16]

The current study is ancillary to the previously described parent study,[5] and addresses several gaps in the literature, including the need for interventions aimed at decreasing levels of maternal stress among MLH[12] and the need for interventions that target parenting efficacy in order to improve parenting skills among MLH.[13] This study evaluated the impact of a parenting efficacy intervention on lowering maternal stress levels among MLH.

Methods

Study design and population

Data were analyzed for the Making our Moms Stronger (MOMS) study, a randomized controlled behavioral trial.[5] To measure the effects of the experimental intervention over and above the positive gains observed from supportive group interactions (especially among stigmatized populations), an attention control design was used, with the two intervention conditions only differing in program content. A computer-generated randomization table assigned participants to either: the theoretically grounded experimental intervention that focused on reducing parenting stress, or the attention-control intervention that focused on reducing health-related stress. All procedures were approved by the Institutional Review Board at the University of Alabama at Birmingham.

Eligibility and recruitment

Women ≥19 years, HIV-infected, primary caregiver of a child ages 4–12, and seeking treatment at an HIV clinic were eligible. Participants were recruited through fliers posted in HIV clinics and local service organizations. Screening visits coincided with clinic appointments. Eligible participants who provided informed consent were scheduled for a baseline data collection visit and randomized to an intervention condition.

Intervention design

Interventions were delivered in six weekly small group ($N = 6–8$) sessions lasting 2.5 h each. Two post-intervention assessments were conducted within 2–4 weeks of their last

Table 1. Demographic and Clinical Characteristics for Study Participants Stratified by Intervention Group Assignment

	All		*Parenting Intervention*		*Health Intervention*		
Characteristics[a]	N	*Mean ± SD median (interquartile range) or %*	N	*Mean ± SD median (interquartile range) or %*	N	*Mean ± SD median (interquartile range) or %*	p *Value*[b]
Age	80	33.1 ± 7.8 32.0 (27.0–38.0)	34	32.9 ± 6.9 32.5 (29.0–38.0)	46	33.2 ± 8.5 32.0 (26.0–38.0)	0.863[c]
Race							0.738
Other	10	12.7	5	14.7	5	11.1	
African American	69	87.3	29	85.3	40	88.9	
Employment status							0.167
Unemployed	49	62.0	18	52.9	31	68.9	
Employed	30	38.0	16	47.1	14	31.1	
Marital status							0.955
Married	23	29.1	10	29.4	13	28.9	
No longer married	17	21.5	8	23.5	9	20.0	
Never married	39	49.4	16	47.1	23	51.1	
Site							0.184
Rural	19	25.0	11	33.3	8	18.6	
Urban	57	75.0	22	66.7	35	81.4	
Clinically stressed at baseline	24	30.0	10	29.4	14	30.4	0.805
Baseline viral load (c/mL)							0.176
Suppressed	41	66.1	20	76.9	21	58.3	
Not suppressed	21	33.9	6	23.1	15	41.7	
Baseline CD4 cell count (cells/μL)	64	442.0 ± 291.9 406.0 (208.5–640.5)	27	476.0 ± 268.0 430.0 (352.0–672.0)	37	417.1 ± 309.4 360.0 (187.0–637.0)	0.251[d]

[a]The total N for each characteristic may differ due to missing data; [b]Fisher's Exact test was used to obtain *p*-values for categorical variables, comparing Parenting Intervention participants to Health Intervention participants; [c]Independent *t*-test was used to obtain *p*-value, comparing Parenting Intervention participants to Health Intervention participants; [d]Wilcoxon nonparametric test was used to obtain *p*-value, comparing Parenting Intervention participants to Health Intervention participants.

Table 2. Pre- and Post-Intervention Assessments of PSI/SF Scale Scores for Participants Stratified by Type of Intervention

PSI/SF Scales	*All (N = 80)*			*Parenting Intervention (N = 34)*			*Health Intervention (N = 46)*			p *Value*
	Median	*Mean ± SD*	*IQR*[e]	*Median*	*Mean ± SD*	*IQR*[e]	*Median*	*Mean ± SD*	*IQR*[e]	
All										
Pre-Intervention										
Parental Distress	29.5	30.5 ± 7.6	25.0–36.0	28.0	30.0 ± 8.0	25.0–37.0	30.0	30.8 ± 7.4	25.0–36.0	0.676
Parent-Child Dysfunctional Interaction	23.0	23.5 ± 6.7	19.0–26.0	22.0	23.2 ± 7.0	17.0–26.0	24.0	23.7 ± 6.5	19.0–26.0	0.772
Difficult Child	27.5	28.8 ± 7.8	24.0–34.0	25.0	27.4 ± 7.9	24.0–32.0	29.5	29.7 ± 7.6	24.0–35.0	0.201
Total Stress (PSI)	81.0	82.7 ± 18.6	69.5–950	79.0	80.7 ± 19.0	66.0–95.0	84.5	84.1 ± 18.4	71.0–94.0	0.418
Post-Intervention										
Parental Distress	29.0	29.1 ± 7.7	24.0–34.0	28.5	28.4 ± 6.6	25.0–32.0	29.5	29.5 ± 8.4	24.0–35.0	0.530
Parent-Child Dysfunctional Interaction	22.5	22.2 ± 7.1	16.0–27.0	20.5	21.4 ± 7.0	15.0–26.0	23.0	22.9 ± 7.3	16.0–28.0	0.344[d]
Difficult Child	26.5	27.4 ± 7.3	22.0–33.0	25.0	26.2 ± 6.0	21.0–30.0	28.0	28.2 ± 8.1	23.0–34.0	0.199
Total Stress (PSI)	77.0	78.6 ± 19.2	64.0–91.5	75.0	76.0 ± 15.4	64.0–87.0	78.5	80.6 ± 21.6	65.0–98.0	0.292
Pre/post –Difference[a]										
Parental Distress	−1.0	−1.4 ± 5.6	−5.0–2.0	−1.0	−1.6 ± 5.7	−4.0–3.0	−1.0	−1.3 ± 5.6	−5.0–2.0	0.798
Parent-Child Dysfunctional Interaction	0.0	−1.2 ± 5.6	−5.5–2.0	−1.0	−1.9 ± 6.2	−6.0–2.0	0.0	−0.8 ± 5.2	−4.0–2.0	0.415
Difficult Child	−1.5	−1.4 ± 5.7	−5.0–3.0	−2.0	−1.3 ± 6.1	−5.0–2.0	−1.0	−1.5 ± 5.5	−4.0–3.0	0.859
Total Stress (PSI)	−2.0	−4.0 ± 13.5	−12.5–4.5	−1.5	−4.7 ± 15.2	−16.0–4.0	−2.5	−3.5 ± 12.3	−10.0–5.0	0.715
	All (N = 33)			*Parenting Intervention (N = 11)*			*Health Intervention (N = 22)*			
	Median	*Mean ± SD*	*IQR*[e]	*Median*	*Mean ± SD*	*IQR*[e]	*Median*	*Mean ± SD*	*IQR*[e]	p *Value*
Highly Stressed Population[b]										
Pre-Intervention										
Parental Distress	37.0	36.8 ± 5.8	32.0–40.0	39.0	38.7 ± 5.8	36.0–42.0	36.0	35.9 ± 5.6	31.0–39.0	0.201
Parent-Child Dysfunctional Interaction	28.0	28.3 ± 6.5	25.0–32.0	31.0	29.7 ± 7.3	25.0–36.0	27.0	27.6 ± 6.0	25.0–31.0	0.426
Difficult Child	36.0	35.2 ± 6.4	32.0–38.0	36.0	35.0 ± 6.9	30.0–40.0	35.5	35.2 ± 6.3	32.0–37.0	0.928
Total Stress (PSI)	97.0	100.3 ± 12.5	90.0–106.0	102.0	103.5 ± 11.8	95.0–108.0	95.0	98.8 ± 12.8	89.0–104.0	0.181[d]
Post-Intervention										
Parental Distress	34.0	33.7 ± 6.3	29.0–39.0	32.0	32.7 ± 5.3	28.0–37.0	34.5	34.2 ± 6.9	30.0–40.0	0.496
Parent-Child Dysfunctional Interaction	25.0	25.9 ± 7.3	21.0–32.0	25.0	25.3 ± 7.8	18.0–34.0	26.0	26.3 ± 7.3	23.0–32.0	0.122
Difficult Child	33.0	32.1 ± 7.1	29.0–37.0	30.0	29.2 ± 7.4	20.0–37.0	33.5	33.6 ± 6.4	29.0–37.0	0.728
Total Stress (PSI)	91.0	91.8 ± 17.1	80.0–106.0	87.0	87.2 ± 16.6	80.0–99.0	95.0	94.1 ± 17.3	80.0–110.0	0.279
Difference										
Parental Distress	−2.0	−3.1 ± 5.5	−6.0–0.0	−5.0	−6.0 ± 5.3	−11.0–0.0	−1.5	−1.7 ± 5.1	−5.0–0.0	**0.039**[e]
Parent-Child Dysfunctional Interaction	−1.0	−2.4 ± 6.1	−7.0–2.0	−6.0	−4.5 ± 7.1	−10.0–1.0	−0.5	−1.4 ± 5.4	−6.0–2.0	0.222
Difficult Child	−2.0	−3.0 ± 6.0	−7.0–1.0	−5.0	−5.8 ± 5.1	−10.0–2.0	−1.0	−1.6 ± 6.1	−7.0–4.0	**0.048**[e]
Total Stress (PSI)	−5.0	−8.5 ± 13.8	−19.0–2.0	−19.0	−16.3 ± 14.6	−24.0–1.0	−3.0	−4.7 ± 12.0	−10.0–3.0	**0.036**[e]

(*continued*)

TABLE 2. (CONTINUED)

	All (N = *24*)			*Parenting Intervention* (N = *10*)			*Health Intervention* (N = *14*)			
	Median	*Mean ± SD*	*IQR*[e]	*Median*	*Mean ± SD*	*IQR*[e]	*Median*	*Mean ± SD*	*IQR*[e]	p *Value*
Clinically Stressed Population[c]										
Pre-Intervention										
Parental Distress	37.5	38.0 ± 5.8	36.0–41.5	38.0	38.7 ± 6.1	36.0–42.0	37.5	37.5 ± 5.8	36.0–40.0	0.614
Parent-Child Dysfunctional Interaction	31.0	30.0 ± 6.5	26.0–34.0	31.5	30.2 ± 7.6	25.0–36.0	30.5	29.8 ± 6.0	26.0–32.0	0.887
Difficult Child	36.5	37.1 ± 5.9	34.0–39.5	37.0	36.1 ± 6.2	32.0–40.0	36.5	37.8 ± 5.9	35.0–38.0	0.511
Total Stress (PSI)	102.5	105.0 ± 11.5	96.0–108.5	103.5	105.0 ± 11.2	96.0–108.0	102.5	105.0 ± 12.2	96.0–109.0	0.907[d]
Post-Intervention										
Parental Distress	35.5	34.9 ± 6.4	30.5–39.5	33.0	33.2 ± 5.3	29.0–37.0	37.0	36.1 ± 6.9	31.0–41.0	0.265
Parent-Child Dysfunctional Interaction	29.0	27.8 ± 7.5	23.0–33.5	25.5	26.3 ± 7.5	21.0–34.0	30.5	28.8 ± 7.6	23.0–33.0	0.435
Difficult Child	34.0	33.5 ± 7.3	29.0–38.0	31.5	30.2 ± 7.3	25.0–37.0	36.5	35.9 ± 6.6	33.0–41.0	0.068
Total Stress (PSI)	98.5	96.1 ± 17.5	86.5–111.5	87.0	89.7 ± 15.1	80.0–99.0	104.0	100.7 ± 18.2	96.0–116.0	**0.049**[d,e]
Difference										
Parental Distress	−3.5	−3.1 ± 6.0	−7.0–0.0	−4.5	−5.5 ± 5.3	−9.0–0.0	−2.5	−1.4 ± 6.0	−5.0–2.0	0.089
Parent-Child Dysfunctional Interaction	−1.0	−2.2 ± 6.7	−7.5–2.0	−5.0	−3.9 ± 7.2	−8.0–1.0	0.5	−1.0 ± 6.2	−7.0–2.0	0.319
Difficult Child	−2.5	−3.6 ± 6.4	−9.5–0.5	−5.5	−5.9 ± 5.3	−10.0–2.0	−1.0	−1.9 ± 6.7	−7.0–5.0	0.122
Total Stress (PSI)	−4.0	−8.9 ± 15.5	−20.0–3.0	−17.5	−15.3 ± 15.0	−22.0–1.0	2.0	−4.3 ± 14.6	−16.0–6.0	0.088

[a]Difference scores are calculated by taking each pre-score and subtracting it from its corresponding post-score; [b]Individuals who had a pre-intervention PSI score of $>85^{th}$ percentile, indicating a high level of parental stress. Frequencies for the Highly Stressed population were calculated among the total population for each intervention (Parenting Intervention, $N=11$; Health Intervention, $N=22$); [c]Individuals who had a pre-intervention PSI score of $\geq 90^{th}$ percentile, indicating a clinically relevant level of parental stress. Frequencies for the Clinically Stressed population were calculated among the total population for each intervention (Parenting Intervention, $N=10$; Health Intervention, $N=14$); [d]Wilcoxon nonparametric test was used to obtain p-value, comparing Parenting Intervention participants to Health Intervention participants. All other p-values were obtained using t-test; [e]IQR: Interquartile Range; [f]Significant at $\alpha=0.05$ level of significance.

intervention session and approximately 6 months following their last intervention session.

The parenting skills intervention was guided by Bowen's Family Systems Theory, which increased our understanding of the complex familial issues that challenge optimal family functioning,[17] and Social Cognitive Theory that assisted in the development of specific program components most likely to enhance maternal self-efficacy and build key parenting skills.[18] Program content focused on: (1) communicating clearly and effectively with children; (2) using positive and negative consequences with their children to effectively change child's behavior; (3) incorporating quality time with their children into their normal routine; and (4) taking care of themselves so they can provide better care for their children. Many participants had multiple children at various ages and levels of development; the parenting intervention stressed the importance of parenting to the child's developmental capabilities, and strategies were specific to the child's age range.

The attention-control health intervention was guided by the Health Self-Empowerment Theory.[19] Program content focused on: (1) maintaining overall health via a healthy diet and physical activity; (2) adhering to medication regimens and keeping clinic appointments; (3) being knowledgeable about their condition in order to better communicate with healthcare providers; (4) being aware of their sexual and physical anatomy to maintain optimal health.

Outcome measure

Parental stress levels were assessed using the parenting stress index short form (PSI/SF), a 36-item questionnaire intended to evaluate factors that contribute to stress in a parent–child relationship.[20] Several studies have tested the validity and reliability of the PSI/SF and provided support for its use in clinical populations.[21–24] The PSI/SF evaluates three components (e.g., subscales) of the parent–child relationship along with their sum: (1) Parental Distress (range of scores: 12–60), (2) Parent–Child Dysfunctional Interaction (range of scores: 12–60), (3) Difficult Child (range of scores: 12–60), and (4) Total Stress, which is calculated as the combined score of all the preceding categories (range of scores: 36–180). The reliability coefficient for the total stress scale is 0.91.[20] Normal range PSI/SF scores place within the 15^{th} to 85^{th} percentile. A high PSI/SF score is considered to be $>85^{th}$ percentile, indicating a highly stressed population. A raw score ≥ 90 ($\geq 90^{th}$ percentile) indicates clinically significant levels of stress with the indication for potential child abuse and neglect.[20] PSI/SF scores were obtained on all participants at baseline and again post-intervention.

Statistical methods and analysis

Demographic and clinical variables were collected at baseline and included race, marital status, employment status, study site, HIV viral load (VL), and CD4 cell count. Baseline VL were categorized based on the Centers for Disease Control and Prevention's definition of HIV VL suppression (≤ 200 vs. >200 copies/mL).[25] A difference in pre-/post-intervention PSI/SF scores was calculated by subtracting pre-intervention PSI/SF scores from post-intervention PSI/SF scores. A positive score indicates an increase in parental stress levels from baseline to post-intervention. Each component of the PSI/SF was further stratified to represent individuals in the population that are categorized as either having a high stress level (>85th percentile) or clinically relevant stress level (≥ 90th percentile).

Using SAS 9.2, analysis of variance (ANOVA) was used to examine the effect of each behavioral intervention on PSI/SF scores. Multivariable linear regression was conducted to determine factors associated with a decrease in PSI/SF score. To compare demographics, baseline clinical characteristics, and PSI/SF subscale scores for participants in the two intervention groups, Fisher's Exact test was used to obtain p-values for categorical variables, t-test was used to obtain p-values for normally distributed continuous variables, and Wilcoxon nonparametric test was used to obtain p-values for continuous variables that were not normally distributed. A p-value of 0.05 was considered statistically significant.

Results

Of 106 enrolled participants (Parenting Intervention $N=52$, Health Intervention $N=54$), 80 ($N=34$ and $N=46$, respectively) had complete outcome data for PSI/SF subscales and were used in the analyses. A sensitivity analysis showed that the 80 participants did not differ significantly from the original 106 participants with regard to demographic and clinical characteristics. The sample was predominantly African American (87.3%), unemployed (62.0%), never married (49.4%), treated at urban sites (75.0%), and presented with suppressed VL (66.1%). Average baseline CD4 cell counts were 442.0 ± 291.9 cells/μL (Table 1). The proportion of highly stressed (>85th percentile of total PSI/SF score) and clinically stressed ($\geq 90^{th}$ percentile of total PSI/SF score) individuals in this population at baseline was 41.3% ($n=33$) and 30.0% ($n=24$), respectively. Among all participants, no significant changes in VL suppression and CD4 cell counts were observed between baseline and post-intervention. However, significant changes in VL suppression were observed between baseline to post-intervention among highly stressed (37.0–38.5%; $p=0.009$) and clinically stressed (45.0–42.1%; $p=0.024$) participants. When all participants and subpopulations (i.e., highly stressed and clinically stressed) were stratified by intervention, significant changes in VL suppression were observed between baseline and post-intervention among highly stressed participants in the health group (38.9–35.3%; $p=0.008$) as well as clinically stressed individuals in the health group (50.0–36.4% $p=0.015$).

Baseline and post-intervention assessments of PSI/SF scales are presented in Table 2. Among all participants, both intervention groups showed a decline in total PSI/SF scores and subscale PSI/SF scores, with no significant differences by intervention. Among participants in the highly stressed population, both intervention groups showed a decline in total PSI/SF scores and subscale PSI/SF scores, however, participants in the parenting group achieved significantly higher average decreases in total PSI/SF scores ($p=0.036$), Parental Distress PSI/SF scores ($p=0.039$), and Difficult Child PSI/SF scores ($p=0.048$) in comparison to the health intervention group. Among participants in the clinically stressed population, both intervention groups showed a decline in total PSI scores and subscale scores, however, participants in the parenting group achieved higher average

decreases in total PSI/SF scores ($p=0.088$), and Parental Distress PSI/SF scores ($p=0.089$) in comparison to the health intervention group. Among all participants, although no significant difference was seen between the interventions and their effect on total PSI/SF scores, all participants decreased total PSI/SF scores from baseline to post-intervention ($p=0.0001$).

A multivariable linear regression model adjusted for age, baseline CD4 cell count, baseline total PSI/SF score, employment status, marital status, and study site determined that among all participants, study site ($p=0.012$) was shown to be a significant predictor of change in total PSI/SF scores from baseline to post-intervention, with treatment at urban sites being predictive of larger changes (Table 3). Participants treated at urban sites showed an average decrease of 5.7 points (95% CI: -9.4, -2.1) in total PSI/SF scores from baseline to post-intervention as opposed to the average increase of 5.2 points (95% CI: -2.6, 13.0) shown in participants treated at rural sites (Table 3). Among participants in the highly stressed population, intervention condition ($p=0.021$) was shown to significantly predict changes in total PSI/SF score from baseline to post-intervention in an unadjusted linear regression model (Table 3), with a larger average decrease of 16.3 points (95% CI: -24.2, -8.4) seen over time in the parenting intervention compared to an average decrease of 4.7 points (95% CI: -10.3, 0.9) in the health intervention (Table 3).

Discussion

The physical, psychological, social, and economic burdens that accompany HIV infection among MLH can impact the overall ability to effectively handle the responsibilities of motherhood, which can result in poor parenting practices and subsequent negative consequences for the child.[11] Findings indicate that both intervention groups in our study experienced significant decreases in parenting stress from baseline to post-intervention; however, there was not enough evidence to suggest that the parenting skills intervention reduced parenting-related stress differently than the health-focused intervention.

The parenting skills intervention demonstrated efficacy among highly stressed MLH, showing significant improvements in Parental Distress, Difficult Child, and total PSI/SF scores. The Parental Distress subscale evaluated the distress experienced by the mother in her role as a parent regarding factors directly related to parenting, such as parenting competence, life role restrictions, conflict with child's father, presence of depression, and lack of social support.[20] Elevated scores indicate the potential for parental loss of control.[20] Social support is a specific factor evaluated by this subscale,[20] and has been shown to relieve stress burden in HIV-infected adults;[16] as such, the group support provided by the intervention could account for the improvement in scores seen from baseline to post-intervention in both groups. The Difficult Child subscale evaluated the behavioral characteristics of the child that determine manageability of the child by the mother.[20] Elevated scores indicate the need for child behavioral management and adjustment.[20] The presence of stressors such as those measured by these subscales may have contributed to the high burden of stress in this population, and thus, may pose the potential for abusive behavior and neglect of their children.[26]

There was no significant difference between intervention conditions in the Parent–Child Dysfunctional Interaction PSI/SF score from baseline to post-intervention. This subscale evaluated the mother's perception of whether the child met the mother's expectations and whether the parent–child interactions were reinforcing the mother's role as a parent.[20] Elevated scores suggest the parent–child relationship is threatened, or has yet to be established.[20] However, lower scores for this subscale at both baseline and post-intervention indicated that this subscale was not a strong contributor to the high stress burden in this population, and that the intervention had the strongest impact on domains that needed the most improvement (i.e., Parental Distress and Difficult Child), with the parenting skills intervention having a significantly stronger impact than the health skills intervention.

Of particular concern was the high prevalence ($\sim 30\%$) of clinically relevant levels of stress among participants. While the clinical cut-off has been reported as $\geq 90^{th}$ percentile, baseline PSI/SF scores among participants in this population were higher than in other populations burdened by a high degree of stress, such as parents having a chronically ill child.[27,28] Parenting stress occurs at a higher rate in persons dealing with chronically ill conditions, and therefore the cut-off point for clinical relevance may differ from those not dealing with chronically ill conditions.[27] The literature has provided insight into the evaluation of parental stress among parents who have chronically ill children;[27,28] however, this study is unique in that it evaluates parental stress among parents who themselves have a chronic condition. Anderson et al. found an association between suboptimal levels of health and clinically defined levels of stress in a population of parents living in high risk communities.[29]

Among our sample in both the highly stressed and clinically stressed participants, the proportion of individuals with suppressed VL decreased significantly from baseline to post-intervention among participants in the health group. This finding may be spurious or explained by an unmeasured factor, as there is no reason to believe that differing intervention content would increase VL among participants. However, research suggests that pregnancy may represent the best time to educate HIV-infected women about health management[30] due to lack of adherence to antiretroviral medications[31] and loss to follow-up of primary care following childbirth.[30] Nevertheless, these findings underscore the importance of evaluating the impact of health status on stress burden and vice versa in high risk populations.

Study findings suggest that individuals identified as clinically or highly stressed at baseline benefited the most from the intervention. The ramifications for children of MLH underscore the critical importance of screening for high and clinically defined stress levels. Incorporating screening into clinical practice could help identify patients who would most benefit from supportive parenting-stress reduction interventions. Tailoring programs to the specific needs of those at greatest risk can help mitigate factors that contribute to heightened parenting stress, thus improving child outcomes through the promotion of positive parenting practices.

Finally, our findings demonstrated that treatment at urban sites predicted larger changes in total PSI/SF scores from pre- to post-intervention. A host of factors could account for differences in total PSI/SF scores by site, given that participants at urban vs. rural sites differed by various clinical and

TABLE 3. UNADJUSTED AND ADJUSTED LINEAR REGRESSION MODELS FOR PREDICTORS OF DIFFERENCES IN PRE- AND POST-INTERVENTION PSI/SF SCORES FOR ALL, HIGHLY STRESSED, AND CLINICALLY STRESSED PARTICIPANTS[a]

	All			*Highly Stressed Population*[c]			*Clinically Stressed Population*[d]		
	PSI Score Difference Mean or Slope	*95% CI*[d]	p *Value*	*PSI Score Difference Mean or Slope*	*95% CI*[d]	p *Value*	*PSI Score Difference Mean or Slope*	*95% CI*[d]	p *Value*
Model 1[b]									
Intervention			0.706			**0.021**[f]			0.085
Health	−3.5	−7.5, 0.4		−4.7	−10.3, 0.9		−4.3	−12.5, 3.9	
Parenting	−4.7	−9.3, −0.1		−16.3	−24.2, −8.4		−15.3	−25.0, −5.7	
Model 2[c]									
Intervention			0.433						
Health	1.0	−4.4, 6.3							
Parenting	−1.5	−7.0, 3.9							
Age[e]	0.2	−0.3, 0.7	0.412						
Marital status			0.617						
Married	−2.6	−8.7, 3.5							
No longer married	1.8	−5.9, 9.5							
Never married	−0.1	−5.8, 5.7							
Employment status			0.986						
Unemployed	−0.2	−5.4, 4.9							
Employed	−0.3	−6.2, 5.6							
Site			**0.012**[f]						
Rural	5.2	−2.6, 13.0							
Urban	−5.7	−9.4, −2.1							
Baseline CD4 count[e] (cells/μl)	−0.001	−0.01, 0.01	0.804						
Baseline PSI/SF Score[e]	−0.2	−0.4, 0.03	0.090						

[a]Due to the low sample size of 33 participants in the highly stressed group and 24 participants in the clinically stressed group, no multivariate models were computed; [b]Model 1 is the unadjusted model; [c]Model 2 is adjusted for Age, Marital Status, Employment Status, Site, Baseline CD4 Cell Count, and Baseline PSI/SF Score; [d]CI: Confidence Interval; [e]PSI/SF Score Difference slope is reported for continuous variables. Least Sqaures Means are reported for categorical variables; [f]Significant at $\alpha = 0.05$ level of significance.

demographic characteristics. Nevertheless, programs should be implemented to improve quality and access to group support and education interventions in both urban and rural areas.[32]

Our findings should be considered within the following limitations: The parent study enrolled 106 (Parenting Intervention $N=52$, Health Intervention $N=54$) participants, but only 80 (Parenting Intervention $N=34$ and Health Intervention $N=46$) had complete outcome data for PSI/SF subscales and were used in the analyses. This is an overall 25% loss, with a higher loss in the parenting-focused intervention (35%) compared to the health-focused intervention (15%). As such, generalization to other populations may be limited due to the small sample size; nevertheless, recruitment from multiple centers increased the external validity. Additionally, no formal evaluation of amount and type of group support participants received prior to, or in addition to the study was conducted. However, given the RCT design, any potential effect on study outcomes should be balanced across study arms. In addition, the lack of a no intervention group may limit the findings, as both interventions were designed to bring meaningful health benefits to this underserved population via different means.

Furthermore, participants were not screened for levels of parenting stress; however, measuring parenting stress as an outcome was not the main objective of the parent study and therefore high and clinical stress levels were not used as enrollment criteria. Finally, although we evaluated multiple outcomes and used $p<0.05$ to determine statistical significance, the observed results may be driven by inflated type I error, as is indicated by the p-values close to 0.05. Nevertheless, these results are exploratory and will help guide future studies.

Conclusions

Results emphasize the high burden of parenting stress in this population, raising concern for the wellbeing of MLH and their children when left unrecognized and untreated. The parenting skills intervention significantly reduced stress levels among MLH experiencing high levels of stress. These findings underscore the importance of screening MLH for parenting stress levels to mitigate its impact on these individuals, their children, and others in their social environments. Supportive group parenting interventions may be a first step in helping MLH cope with stress and parenting challenges.[13] Further research is needed to examine the long-term efficacy and cost-effectiveness of interventions tailored to the needs of MLH and their children.

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