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Coping strategies mediated the relationship between perceived stress and hair cortisol among socioeconomically marginalized parents

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ABSTRACT

Objective: This study aimed to (1) examine coping strategies and their relationship with demographics, perceived stress, and hair cortisol; and (2) explore whether coping partially mediated the relationship between perceived stress and hair cortisol.

Methods: Baseline data from 191 socioeconomically marginalized parents enrolled in two community-based clinical trials were used. The IBM SPSS Statistics Version 27 and Mplus Version 8 were used for data analyses.

Results: Parents' engagement in various coping strategies differed by age, ethnicity, race, marital status, education level, and number of children living in the household. Parents' use of problem-focused (instrumental support, planning), emotion-focused (venting, self-blame), and avoidant coping (self-distraction, denial, behavioral disengagement) increased from having low to moderate stress. However, when perceived stress increased from moderate to high, their use of emotion-focused and avoidant coping increased significantly, but problem-focused coping did not. Emotion-focused coping lowered the influence of perceived stress on hair cortisol, while avoidant coping increased the relationship between perceived stress and hair cortisol.

Conclusions: Although needing future investigation with longitudinal studies, the results suggest the need of promoting adaptive emotion-focused coping (emotional support, venting, and humor) to help socioeconomically marginalized parents manage their appraised overwhelming and uncontrollable stressors of food, house, and income insecurity.

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Introduction

Parents with young children experience high levels of stress, especially those from socioeconomically marginalized families (Ho et al., 2022). This stems from not only daily

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stress related to taking care of young children but additional stress due to unemployment and other financial insecurities (Fang et al., 2024). In the wake of the COVID-19 pandemic, there has been a drop in income for most households. However, low-income families incurred a greater financial burden, according to the Pew Research Center (Kochhar & Sechopoulos, 2022). The COVID-19-related financial burden has led to further increases in stress, anxiety, and depression among parents, exacerbating the existing health disparities according to socioeconomic inequities (Whaley & Pfefferbaum, 2023). Parents' heightened stress cannot only negatively affect their own health but also contribute to their children's behavioral problems and impaired relationships between parents and children (Jarvers et al., 2023; Robbins & Ling, 2022; Wadsworth, 2012). Thus, implementing effective methods to alleviate parents' stress is critical to promote the entire family's well-being.

Unfortunately, previous stress management interventions with socioeconomically marginalized parents only result in a small and short-term effect on reducing their stress (Ling et al., 2021). One possible reason is that previous interventions did not consider the unique challenges experienced by these marginalized parents (Hodgkinson et al., 2017). One unique challenge often experienced by socioeconomically marginalized individuals is the heightened mental health stigma, deterring them from seeking out help and support to cope with increased stress (Naslund & Deng, 2021). Additional challenges are a lack of knowledge, time, support, and even trust toward mental healthcare professionals (Henderson et al., 2015). The mistrust often stems from the thought that seeking out help could lead to hospitalization, overmedication, or separation from their families (Hodgkinson et al., 2017). The lack of time was further reflected in a recent meta-analysis finding that interventions with a shorter duration (1–3 months) resulted in greater effects on reducing parental stress than those with a longer duration (>3 months) because participation burden amplified as intervention duration increased (Ling et al., 2021). Another important explanation is previous interventions failed to either recognize the unique stressors (insecure food, house, and income) experienced by socioeconomically marginalized individuals or incorporate the appropriate coping strategies into the intervention development (Ling et al., 2021; Ryu & Fan, 2023).

Effective coping strategies are a key mechanism for managing ongoing daily stressors (Holahan et al., 2005). Coping strategies can be categorized into three large groups: problem-focused (focus on problem solving including active coping, use of instrumental support, positive reframing, and planning), emotion-focused (handle feelings due to stress including use of emotional support, venting, humor, acceptance, religion, and self-blame), and avoidant (deny or escape from stressful situations or feelings including self-distraction, denial, substance use, and behavioral disengagement) coping (Dias et al., 2012). Various coping strategies often result in different effects on managing stress (Rodrigues et al., 2023), with problem-focused coping being an adaptive coping strategy while avoidant coping being considered a maladaptive coping strategy and can result in worse mental health (Holahan et al., 2005; Nagane et al., 2023). However, results on the effects of emotion-focused coping are inconsistent, with some showing beneficial effects and others demonstrating unfavorable effects on reducing stress (Bani-Issa et al., 2022; Ding et al., 2021). In addition, effects of coping strategies on managing stress vary according to the stressors being experienced. When confronted with uncontrollable stressors such as food, house, and income insecurity, individuals tend to apply more avoidant

or emotion-focused coping (Newman et al., 2011; Yolanda & Risnawaty, 2021). Although identifying various coping strategies applied by socioeconomically marginalized parents is critical for developing effective coping-based interventions, very few studies have focused on this population and most studies are qualitative (Atkins et al., 2022; Leung, 2020). Prior literature has identified coping as a mediator in various contexts: between resilience and salivary cortisol (Zapater-Fajarí et al., 2021), between life satisfaction and perceived stress (Gori et al., 2020), and between stressful events and mental outcomes (Connor-Smith & Compas, 2002). However, to the best of our knowledge, no study has specifically examined the potential mediating role of coping in the relationship between perceived stress and physiological cortisol release in response to stress, particularly among socioeconomically marginalized parents.

To address these literature gaps and expand our understanding of coping strategies used by socioeconomically marginalized parents, this quantitative study sought to (1) describe the various coping strategies (measured by the 28-item Brief COPE) applied by parents to manage their stress; (2) examine the relationships of coping strategies with parents' demographics, perceived stress level, and hair cortisol; and (3) explore whether coping strategies partially mediated the relationship between perceived stress and hair cortisol among socioeconomically marginalized parents. Results from this study can provide an important foundation for developing more effective coping-based interventions that are tailored and culturally competent for parents from socioeconomically marginalized backgrounds.

Theoretical framework

The study was guided by the transactional theory of stress and coping (Lazarus & Folkman, 1987) and the allostatic load model (McEwen, 2000). According to the transactional theory of stress and coping, individuals cognitively assess stressful situations and choose to respond with various coping strategies such as problem-focused and emotional-focused coping (Lazarus & Folkman, 1987). Based on the allostatic load model, when individuals perceive to experience stress, they will respond behaviorally via coping behaviors and physiologically via releasing cortisol (McEwen, 2000). In addition, coping behavioral responses partially mediate the influence of perceived stress on physiologic responses (McEwen, 2000). Built on these two models, this study hypothesized that parents' perceived stress would be correlated with coping strategies and coping strategies would partially mediate the relationship between perceived stress and hair cortisol.

Methods

Design and sample

This study used baseline data from two community-based clinical trials conducted in 2021–2023 (Ling, Chen, et al., 2024; Ling, Suriyawong, et al., 2024). Both clinical trials were approved by the Michigan State University Biomedical and Health Institutional Review Board with approval numbers STUDY00001629 and STUDY00003349. Primary caregivers or legal guardians (referred to as parents hereafter) with young

children aged 3–5 years old were non-randomly recruited from four non-profit Head Start organizations in the Midwest of the US. Various recruitment methods were used including in-person recruitment during drop-off and pickup time, virtual recruitment at daycare orientation and parent meetings, and recruitment flyers being distributed to parents via daycare teachers. Parental consent and child verbal assent (if being 5 years old) were obtained before any data collection. Among the 931 children from 23 urban and rural Head Start daycare centers, 249 (26.7%) families completed the enrollment and screening survey via Qualtrics and were assessed for eligibility. Among those assessed, 191 (76.7%) parents were eligible and completed baseline data collection.

Measures

Demographics were assessed using a demographic survey completed by parents via Qualtrics to describe their age, sex, ethnicity, race, marital status, employment status, education level, annual family income, and number of children living in the household. Mothers' pregnancy status was assessed as well.

Perceived stress was assessed using the 10-item Perceived Stress Scale (Cohen, 1986). The 10-item scale has stronger reliability (Cronbach's alpha > 0.70, test–retest reliability > 0.70) and validity (related to anxiety and depression) than the original 14-item scale (Lee, 2012). It is a 5-point Likert scale with responses of never, almost never, sometimes, fairly often, and very often. A sum score was calculated with a higher score indicating a higher level of perceived stress. Based on the total score, individuals can be grouped into low stress (0–13), moderate stress (14–26), and high stress (27–40) (Philpott et al., 2022).

Coping strategies were assessed by the 28-item Brief COPE (Carver, 1997). Each survey item has four response choices including I haven't been doing this at all, I've been doing this a little bit, I've been doing this a medium amount, and I've been doing this a lot. The Brief COPE contains 14 coping strategies: active coping, use of instrumental support, positive reframing, planning, use of emotional support, venting, humor, acceptance, religion, self-blame, self-distraction, denial, substance use, and behavioral disengagement. The 14 coping strategies can be further grouped into problem-focused (active coping, use of instrumental support, positive reframing, planning), emotion-focused (use of emotional support, venting, humor, acceptance, religion, and self-blame), and avoidant coping (self-distraction, denial, substance use, and behavioral disengagement) (Dias et al., 2012). The mean score for each coping strategy was calculated with a high score indicating a higher degree of applying that coping strategy.

Hair cortisol was analyzed from collected hair samples at the Hormone Assay Core Laboratory at the University of Massachusetts Amherst and the Child Study Center laboratory at Yale University. Hair cortisol was used as an indicator for allostatic load because it reflects long-term cortisol exposure, in contrast to cortisol measured in urine or serum, which primarily reflects acute or short-term levels (Greff et al., 2019; Wippert et al., 2014). Proximal 50–100 strands of hair were clipped close to the scalp from 2 to 3 locations at the posterior vertex of each parent's head to make the cuts less noticeable with a stainless-steel styling shear by trained data collectors. The data collectors cut a 3-cm hair sample segment from the root, labled the hair sample at the root ends away from the head, and put the sample in separate alumimum foil bags. We shipped all packed hair samples to labs for cortisol extraction. At the lab, technicians

first weighed and washed the hair samples twice for 3 min in isopropanol. Following this, they dried and ground the samples into a fine powder using a bead mill (BioSpec Mini-Beadbeater-16). Cortisol, quantified in pg/mg, was extracted from the powdered hair by incubating it with methanol for 18–24 h. After evaporating the methanol extracts, cortisol was reconstituted in an assay buffer. To remove particulate matter from the reconstituted samples, lab technicians used filtration with Corning Costar Spin-X 0.45 µm cellulose acetate filters, and then analyzed cortisol levels in duplicate using an enzyme-linked immunosorbent assay (ELISA, Arbor Assays DetectX) (Meyer et al., 2014). The average intra- and inter-assay coefficient of variation was 11.8% and 7.68%, respectively.

Data collection

Parents completed an online survey via Qualtrics assessing their demographics, perceived stress, and coping strategies. After parents completed the study enrollment and screening survey, they would receive the online survey link via text message or email if being determined meeting the eligibility criteria. After they completed the online survey, then an in-person data collection appointment was scheduled for hair sample collection at a local Head Start daycare center. Trained data collectors clipped a hair sample from each parent who provided informed consent for hair sample collection. Parents received a monetary incentive of a $20 gift card for providing a hair sample for cortisol analysis.

Data analysis

The IBM SPSS Statistics Version 27 and Mplus Version 8 were used for performing all data analyses. Because the hair cortisol data were very skewed to the right, a log transformation was applied to reduce the skewness and make the distribution more symmetrical. Means, standard deviations, frequencies, and percentages were calculated to describe all study variables. Pearson bivariate correlations were used to examine the relationships of coping strategies with parents' age and the number of children living in the household. Multivariate general linear modeling was applied to examine the relationships between categorical demographics (fixed factors including sex, ethnicity, race, marital status, education level, employment status, and annual family income) and coping strategies (dependent variables) after adjusting for parents' age and number of children living in the household (covariates). One-way ANOVA was performed to examine whether the use of coping strategies differed by perceived stress level (low, moderate, and high). Path analysis with a maximum likelihood estimator was conducted using the Mplus Version 8 to examine whether coping strategies (problem-focused, emotion-focused, and avoidant coping) partially mediated the relationship between perceived stress and hair cortisol. Adequate model fit was achieved when comparative fit index (CFI) > 0.90, Tucker-Lewis index (TLI) > 0.90, standardized root mean squared residual (SRMR) < 0.08, and relatively new root mean square error of approximation (RMSEA) < 0.10 (Smith & McMillan, 2001). Multicollinearity was assessed using variance inflation factor (VIF), and multicollinearity existed between independent variables when VIF > 5 (Craney & Surles, 2002). In this study, all bivariate correlation coefficients between coping strategies

were less than 0.80 and the VIF among coping strategies was between 1.57 and 3.08, indicating multicollinearity was not a concern.

Results

Demographics

A total of 191 parents participated in the study, with a mean age of 30.28 years old (range: 20–49). The majority (92.2%) of the parents were female, with 7% being pregnant. About 7.9% were Hispanic and 24.6% were Black. Nearly half of the parents were single, 56.3% had annual family income <$20,000, 45.9% were unemployed, and 53.5% did not have

Table 1. Parents' demographics and coping strategies.

Variable	Mean or *n*	SD or %
Age S (years)	30.28	5.93
Sex (female)	178	92.2%
Ethnicity (Hispanic)	15	7.9%
Race		
White	116	60.7%
Black	47	24.6%
Multiracial	18	9.4%
Other (Asian, Native)	10	5.2%
Marital status		
Married or partnered	79	43.2%
Separated, divorced, or widowed	14	7.7%
Single	90	49.2%
Annual family income		
<$20,000	103	56.3%
$20,000–29,999	34	18.6%
$30,000–49,999	37	20.2%
≥$50,000	9	4.9%
Employment status		
Full-time	56	30.6%
Part-time	43	23.5%
Unemployed	84	45.9%
Education level		
<High school graduate	24	13.1%
High school graduate	74	40.4%
Some college	57	31.2%
Technical school or community college degree	20	10.9%
≥Bachelor's degree	8	4.4%
Pregnant	12	7.0%
Number of children living in the household	2.75	1.46
Perceived stress	17.71	7.72
Coping strategies		
Active coping	2.75	.81
Use of instrumental support	2.19	.93
Positive reframing	2.57	.87
Planning	2.65	.95
Use of emotional support	2.31	.92
Venting	1.75	.72
Humor	1.79	.90
Acceptance	2.52	.87
Religion	2.15	1.03
Self-blame	1.91	.96
Self-distraction	2.26	.84
Denial	1.43	.69
Substance use	1.11	.37
Behavioral disengagement	1.34	.58

any college education. On average, each family had three children living in the household. Table 1 demonstrates the demographics of the participants.

Coping strategies by demographics

According to Table 1, parents applied a higher degree of problem-focused (including active coping, planning, positive reframing, and use of instrumental support) and emotion-focused coping (including acceptance, use of emotional support, and religion) than avoidant coping to manage stress. Older parents were more likely to use instrumental support ($r = 0.18$, $p = .018$). The fewer children living in the household were significantly related to the increased degree of applying positive reframing ($r = -0.16$, $p = .029$) and acceptance ($r = -0.16$, $p = .034$).

As shown in Table 2, Hispanic parents reported more substance use than non-Hispanic parents (1.35 vs. 1.12, $p = .038$). White parents applied a significantly higher degree of emotional support than non-White parents (i.e. Black, multiracial, Asian, native; 2.67 vs. 2.13, $p < .001$), while non-White parents used significantly more emotion-focused coping including humor (2.13 vs. 1.74, $p = .006$) and religion (2.11 vs. 1.76, $p = .032$), as well as avoidant –denial (1.65 vs. 1.39, $p = .020$) coping strategies than White parents after adjusting for other demographics. Parents who were separated, divorced, widowed, or single reported significantly more problem-focused coping including planning (2.90 vs. 2.51, $p = .008$) and active coping (3.01 vs, 2.65, $p = .015$) than those being married or partnered. Additionally, parents with an education level of $\leq$ high school applied significantly more denial coping strategy than those with > high school education level (1.63 vs. 1.41, $p = .048$) after controlling for other demographics including age, sex, ethnicity, race, marital status, employment status, annual family income, and number of children living in the household.

Coping strategies by perceived stress level

The use of problem-focused (instrumental support: $F = 6.59$, $p = .002$; planning: $F = 7.60$, $p < .001$), emotion-focused (venting: $F = 36.62$, $p < .001$; humor: $F = 7.23$, $p < .001$; self-blame: $F = 38.90$, $p < .001$), and avoidant coping (self-distraction: $F = 21.67$, $p < .001$; denial: $F = 18.64$, $p < .001$; substance use: $F = 8.41$, $p < .001$; behavioral disengagement: $F = 39.18$, $p < .001$) differed significantly by parents' perceived stress level (see Figure 1). Specifically, parents' use of problem-focused (instrumental support: $M = 1.83$ vs. 2.29, $p = .008$; planning: $M = 2.25$ vs. 2.76, $p = .003$), emotion-focused (venting: $M = 1.34$ vs. 1.79, $p < .001$; self-blame: $M = 1.29$ vs. 1.97, $p < .001$), and avoidant coping (self-distraction: $M = 1.80$ vs. 2.33, $p < .001$; denial: $M = 1.11$ vs. 1.45, $p = .004$; behavioral disengagement: $M = 1.04$ vs. 1.33, $p = .001$) increased from having low stress to moderate stress. However, when their perceived stress increased from moderate to high, their use of emotion-focused (venting: $M = 1.79$ vs. 2.62, $p < .001$; humor: $M = 1.80$ vs. 2.38, $p = .017$; self-blame: $M = 1.97$ vs. 3.10, $p < .001$) and avoidant coping (self-distraction: $M = 2.33$ vs. 3.05, $p < .001$; denial: $M = 1.45$ vs. 2.10, $p < .001$; substance use: $M = 1.11$ vs. 1.38, $p = .005$; behavioral disengagement: $M = 1.33$ vs. 2.14, $p < .001$) increased

Table 2. Coping strategies by demographic factors after adjusting for covariates.

	Sex		Ethnicity		Race		Marital status		Education		Employment		Family income	
Coping strategies	*F*	*p*	*F*	*P*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*
Problem-focused coping														
Active coping	.66	.418	.05	.820	.19	.660	7.29	**.008***	.45	.506	.53	.593	.08	.777
Use of instrumental support	.21	.648	.07	.788	2.39	.124	1.93	.167	.49	.483	2.39	.095	3.22	.074
Positive reframing	.01	.915	.17	.680	.52	.473	3.35	.069	.03	.859	.41	.663	3.22	.074
Planning	.38	.537	0	.985	.35	.555	6.00	**.015***	.36	.552	.07	.933	.42	.520
Emotion-focused coping														
Use of emotional support	.93	.337	.23	.634	15.31	**<.001***	1.53	.217	.39	.532	1.87	.157	1.49	.224
Venting	.11	.744	1.31	.254	0	.998	.78	.378	.66	.418	.68	.508	1.46	.228
Humor	.60	.438	0	.983	7.69	**.006***	.19	.662	1.44	.232	.166	.847	1.21	.273
Acceptance	1.45	.230	1.12	.292	.97	.326	2.71	.102	.30	.582	.477	.621	1.68	.196
Religion	.36	.548	1.29	.257	4.70	**.032***	2.25	.136	.35	.554	.75	.476	1.68	.197
Self-blame	.28	.595	3.92	.049	.16	.686	3.29	.071	.26	.613	.55	.577	.01	.937
Avoidant coping														
Self-distraction	.97	.327	.57	.451	2.97	.087	3.00	.085	.01	.919	.46	.633	.17	.677
Denial	.27	.607	2.67	.104	5.53	**.020***	.38	.539	3.96	**.048***	.74	.478	.33	.569
Substance use	.43	.512	4.39	**.038***	.17	.679	1.53	.218	.10	.757	.65	.523	1.34	.249
Behavioral disengagement	.88	.349	.02	.883	3.38	.068	1.95	.165	1.60	.207	.47	.624	.65	.423

*$p < .05$.

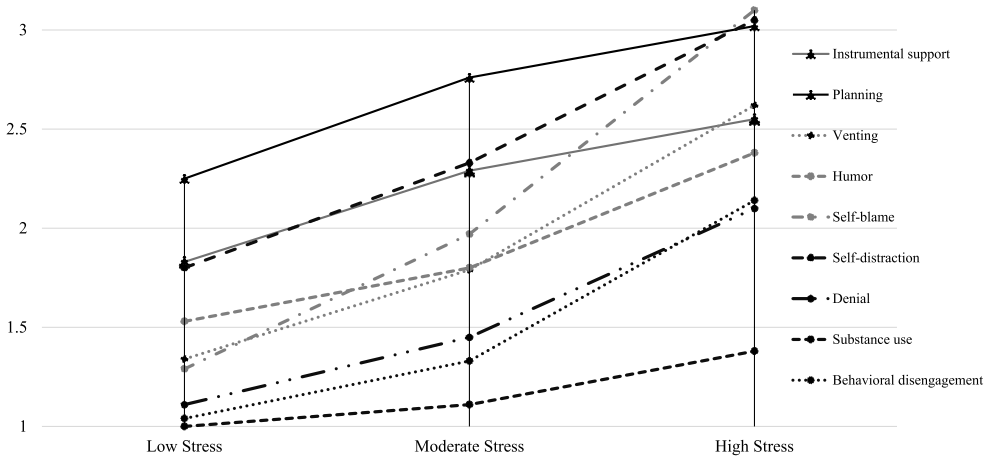

Figure 1. Coping strategies varied significantly by the perceived stress level. A line diagram with two solid lines and seven dotted lines showing the different engagements of coping strategies varied by the perceived stress level. The two solid black lines represent problem-focused coping (instrumental support and planning), the three dotted gray lines denote emotion-focused coping (venting, humor, and self-blame), and the four dotted black lines represent avoidant coping (self-distraction, denial, substance use, and behavioral disengagement).

significantly, but did not for any of the problem-focused coping strategies. There was no significant relationship ($r = -0.07$, $p = .491$) between perceived stress and hair cortisol.

Coping strategies mediated the relationship between perceived stress and hair cortisol

The path model with perceived stress, problem-focused coping, emotional-focused coping, avoidant coping, and hair cortisol had an excellent fit with the data (CFI = 0.995, TLI = 0.954, SRMR = 0.039; RMSEA = 0.088, 90%CI of RMSEA: 0–0.24). As shown in Table 3, a higher level of perceived stress was significantly related to a

Table 3. Coping strategies mediated the relationship between perceived stress and hair cortisol.

Effects	Unstandardized Coefficient B	Standardized Coefficient β	*p*-Value
Direct effects			
Perceived stress → problem-focused coping	0.02	0.19	**.007***
Perceived stress → emotion-focused coping	0.03	0.45	**<.001***
Perceived stress → avoidant coping	0.04	0.64	**<.001***
Problem-focused coping → hair cortisol	0.35	0.30	**.007***
Emotion-focused coping → hair cortisol	−0.64	−0.42	**.005***
Avoidant coping → hair cortisol	0.57	0.30	**.007***
Indirect effects			
Perceived stress → problem-focused coping → hair cortisol	0.01	0.06	.077
Perceived stress → emotion-focused coping → hair cortisol	−0.02	−0.19	**.010***
Perceived stress → avoidant coping → hair cortisol	0.02	0.19	**.008***

*$p < .05$.

higher degree of engaging in problem-focused ($\beta = 0.19$, $p = .007$), emotion-focused ($\beta = 0.45$, $p < .001$), and avoidant coping ($\beta = 0.64$, $p < .001$). Additionally, problem-focused ($\beta = 0.30$, $p = .007$) and avoidant ($\beta = 0.30$, $p = .007$) coping were positively correlated with hair cortisol, while emotion-focused coping ($\beta = -0.42$, $p = .005$) was negatively related to hair cortisol. About the indirect effects, emotion-focused coping lowered the influence of perceived stress on hair cortisol ($\beta = -0.19$, $p = .010$), while avoidant coping increased the relationship between perceived stress and hair cortisol ($\beta = 0.19$, $p = .008$). This path model explained about 3.6%, 20.1%, 40.9%, and 9% variances in problem-focused coping, emotion-focused coping, avoidant coping, and hair cortisol, respectively.

Discussion

This study provides important information on the various coping strategies applied by socioeconomically marginalized families with young children. Their coping strategies utilized varied by parents' demographics including age, ethnicity, race, marital status, education level, and number of children living in the household. In addition, parents' perceived stress level was related to the types of coping strategies engaged. Specifically, parents' engagement in emotion-focused coping increased as their perceived stress level increased, but not their problem-focused coping. What is concerning is that parents applied more avoidant coping when having a high level of stress. Coping was also identified as a significant mediator between perceived stress and hair cortisol: emotion-focused coping demonstrated a defensive effect, while avoidant coping showed a harmful effect. This suggests that coping with emotions may ameliorate the impact of perceived stress on its biological manifestation. In contrast, avoiding stresses may lead to allostatic load due to cumulative cortisol increase.

This study found that coping strategies varied by parents' demographics including age, ethnicity, race, marital status, education level, and number of children living in the household. Specifically, older parents applied more instrumental support (one type of problem-focused coping), which is expected. However, it is controversial with a previous study of 647 parents of children aged 0–8 years, showing no significant age differences between parents with high support and those with moderate or low social support (Fierloos et al., 2023). These contradictory results may be due to the different study samples as participants in the previous study were older and from the Netherlands or the various social contexts epitomized by one being conducted before the global COVID-19 pandemic while this study was completed during the pandemic (Fierloos et al., 2023). In this study, Hispanic parents were more likely to apply substance use (one type of avoidant coping) than non-Hispanic parents. However, Hickey et al. (2021) found that Hispanic parents utilized less avoidant coping compared to non-Hispanic peers. This discrepancy may be explained by different levels of stress as Hispanic parents in the previous study reported lower levels of stress than non-Hispanic parents (Hickey et al., 2021) whereas Hispanic parents reported higher levels of stress than non-Hispanic parents in the current study. These results further imply that avoidant coping may not be an effective way of coping with stress. Furthermore, non-White parents were found to apply more emotion-focused and avoidant coping than White parents, which is consistent with previous studies (Ernst et al., 2021; Kawakami et al., 2020). These identified

ethnic and racial differences in coping strategies should be considered in future research when developing coping-based interventions to reduce stress.

Very interestingly, not married or partnered parents applied more problem-focused coping (e.g. planning, or active coping) compared to those being married or partnered. Although dyadic coping (couples cope with stress together) is critical for maintaining marital quality, literature does suggest that individuals in same-sex marriages usually receive more positive support and cope with stress more collaboratively than those in different-sex marriages (Wang & Umberson, 2023). In this study, most parents are in different-sex marriages or partnerships, which may not contribute to the increase in dyadic coping. Another plausible explanation is that married or partnered parents may prefer more emotion-focused coping from their spouses or partners (e.g. emotional support, venting, and humor) instead of problem-focused coping. In addition, this study found that parents with a low education level tended to use more denial coping (a type of avoidant coping) than those with a high education level, which is supported by a previous study with 26,016 adults in the United Kingdom (UK) (Fluharty & Fancourt, 2021). Perhaps this occurs because parents with higher education levels have gained knowledge to seek more adaptive coping strategies to manage stress than those with lower education levels. Another possible reason is that well-educated individuals usually report lower levels of work-related stress than less educated individuals (Schoger, 2023). Therefore, future interventions need to be tailored according to parents' marital status and education level to achieve optimal effects.

Encouragingly, parents engaged in more problem- and emotion-focused coping when experiencing a moderate level of stress. Unfortunately, their engagement in problem-focused coping did not increase when facing high levels of stress. Instead, they relied more on emotion-focused and avoidant coping to manage their high levels of stress. However, based on the literature, avoidant and some emotion-focused coping (e.g. self-blame) strategies are not effective in managing stress (Babore et al., 2020; Guruprakash et al., 2018). For example, one study with 595 healthcare professionals identified that more avoidant coping was related to high levels of stress (Babore et al., 2020). Similarly, data from 68 postgraduate medical residents suggested that higher levels of perceived stress were significantly correlated with more utilization of some emotion-focused (e.g. self-blame) and avoidant coping strategies (Guruprakash et al., 2018). Likewise, this study found that avoidant coping worsened the effects of perceived stress on increasing hair cortisol. Given the ineffectiveness of avoidant and some emotion-focused coping on managing stress, equipping parents with the appropriate coping strategies is critical for maintaining their mental well-being. Research has demonstrated that high levels of self-efficacy (i.e. belief in one's capacities to successfully execute the behavior) are associated with lower levels of perceived stress (Ding et al., 2021). Thus, developing intervention strategies to increase parents' self-efficacy for applying appropriate coping strategies to manage stress may be promising, especially given that these parents are socioeconomically disadvantaged with limited resources and tend to perceive their stressors (food, house, and income insecurity) as challenging and hopeless (Ryu & Fan, 2023).

Unexpectedly, this study revealed a significant positive relationship between problem-focused coping and hair cortisol. Previous research, however, has identified problem-focused coping to be more beneficial to reduce the biological impact (e.g. cortisol release) of stress. For instance, Nagane et al. (2023) observed a significantly lower level

of salivary cortisol in college students who engaged in more problem-focused coping than those who did not, whereas concentrations of salivary cortisol were not correlated with emotion-focused or avoidant coping. A possible explanation is the various anticipatory stress regulations: individuals with a positive anticipatory cognitive stress appraisal perceive the upcoming stressful events as being expected and manageable; while those with a negative anticipatory cognitive stress appraisal anticipate the upcoming events as disruptive and uncontrollable due to lack of resources, leading to higher cortisol release (Pulopulos et al., 2020). While college students in the previous study (Nagane et al., 2023) might anticipate their situations to be manageable with problem-focused coping; parents in this study, however, might perceive their life situations as being overwhelming and out of control due to limited resources as a socioeconomically marginalized group even with problem-focused coping. This solidifies the importance of context and the sources of the stressors with which individuals are attempting to cope.

Fortunately, the study found a significant protection role of emotion-focused coping to help buffer the influence of perceived stress on cortisol release. With parents from socioeconomically marginalized families having a negative anticipatory cognitive stress appraisal, emotion-focused coping may be more effective to accept their current socioeconomic status and manage parental stress due to their young children's behavior problems. Consistently, a qualitative study with four mothers found that parents applied more emotion-focused than problem-focused coping to manage stress due to lack of resources or social support with regard to their children's online learning during the COVID-19 pandemic (Yolanda & Risnawaty, 2021). In addition, another study with 417 working and 403 nonworking women observed that working women had a lower salivary cortisol level than nonworking women because working women utilized some adaptive emotion-focused coping strategies such as emotional support, venting, and humor (Bani-Issa et al., 2022). Therefore, future efforts may focus on promoting adaptive emotion-focused coping to help these socioeconomically marginalized parents to effectively manage their appraised overwhelming and uncontrollable stressors of food, house, and income insecurity.

Limitation

The study has a few potential limitations. The cross-sectional nature of the study limits the determination of causal relationships among study variables. Therefore, longitudinal studies are desired to further verify the study results. Some potential confounding factors, such as sense of coherence, steroid medication, and chronic illnesses (e.g. diabetes and hypertension), were not measured in the study. A sense of coherence, comprising of comprehensibility, manageability, and meaningfulness, is known to be associated with better mental health and could have influenced the study's results (Koppner et al., 2024). Moreover, steroid medications and chronic illnesses can affect the hypothalamic-pituitary-adrenal (HPA) axis, leading to higher or lower levels of hair cortisol (Degroote et al., 2023; Stalder et al., 2017). Future research should consider including these potential confounders to provide a more comprehensive understanding of the study's findings. In this study, hair cortisol was extracted using ELISA due to its cost-effectiveness and efficiency (Greff et al., 2019). However, this method is less specific compared to liquid chromatography-mass spectroscopy (LC-MS/MS) and generally yields higher levels of hair cortisol

than LC-MS/MS (Greff et al., 2019). Consequently, the relationships among perceived stress, coping, and hair cortisol might differ if LC-MS/MS was used for extraction. Moreover, social desirability and recall bias may exist due to the parent-reported data on perceived stress and coping strategies. However, both the 10-item Perceived Stress Scale and Brief COPE are classic instruments for assessing stress and coping. Additionally, the study population is ethnic and racial diverse parents with young children from socioeconomically marginalized families. The majority of parents in the study are female, so the results may not be generalizable to other populations, particularly fathers. Compared to fathers, mothers are more likely to employ emotion-focused coping strategies (Sullivan, 2002). Lastly, the study data were collected during a global pandemic time, there may be confounding effects on the study results.

Conclusions

Results from this study set an important foundation for understanding various coping strategies applied by parents from socioeconomically marginalized families and their relationships with perceived stress levels and hair cortisol. The identified demographic differences (e.g. age, ethnicity, race, marital status, education level, and number of children living in the household) in coping strategies should be carefully considered when developing future coping-based interventions. Given the unmanageable nature of stressors due to food, house, and income insecurity appraised by these parents, focusing on promoting adaptive emotion-focused coping (e.g. emotional support, venting, and humor) may hold the promise of controlling their high levels of stress. In conclusion, equipping parents the appropriate and tailored coping strategies is critical for maintaining their well-being mentally and physiologically.

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Author contributions statement

JL: conception and design of the study, analysis and interpretation of the data, the drafting of the paper, revising it critically for intellectual content. SC: the drafting of the paper, revising it critically for intellectual content. MM: the drafting of the paper, revising it critically for intellectual content. All authors approved the final version of the manuscript for submission.

Data sharing statement

Deidentified participant data can be requested from the PI.

Ethics statement

Both clinical trials were approved by the Michigan State University Biomedical and Health Institutional Review Board with approval number of STUDY00001629 and STUDY00003349. Parental consent and child verbal assent (if being 5 years old) were obtained before data collection.

Institutional review board statement

The study was conducted in accordance with the Declaration of Helsinki and was approved by an Institutional Review Board. See details under Methods.

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