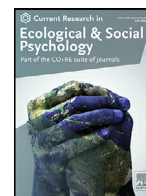




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Under the same roof: Parents' COVID-related stress mediates the associations between household crowdedness and young children's problem behaviors during social distancing

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A B S T R A C T

During the COVID-19 pandemic, families worldwide are confined in their homes for an extended period of time due to social distancing. Conducted between April and July of 2021, the current study examined the impact of household crowdedness during school closure on parents' COVID-related stress and young children's problem behaviors in Hong Kong, one of the world's most densely populated cities. Parents of 228 young children between 3- to 5-year-old reported their household living condition, parents' COVID-related stress, and their children's externalizing and internalizing behaviors through an online survey. The result revealed that household crowdedness was predictive of parents' COVID-related stress. Furthermore, parents' COVID-related stress significantly mediated the associations between household crowdedness and children's internalizing and externalizing behaviors, controlling for family socioeconomic status. The study contributed to the growing research on the impact of the physical living environment as part of the ecological systems on family and child functioning. In time of crisis, young children rely on schools to support their development and wellbeing. The current findings caution the decision of school closure.

During the COVID-19 pandemic, families worldwide are confined in their homes for an extended period of time due to social distancing. Confinement related stress and household crowdedness undermine relationship quality among family members (Prime et al., 2020), and have negative consequences on both parents' and children's well-being (Leventhal & Newman, 2010; Gassman-Pines et al., 2020). As such, understanding the impact of the physical living environment on family and child functioning is more urgent than ever. Ecological models argue that individuals should be examined in context including both social and physical environments (Ackerman & Brown, 2010; Bronfenbrenner, 1994; Luster & Okagaki, 2006). The family's living condition, including the amounts of indoor or outdoor space, people per room, family size, and residential density, forms one important component of the ecological system, which affects child outcomes in two pathways: directly (Evans & Wachs, 2010), and indirectly through parenting (Corapci & Wachs, 2002).

Studies have shown that children exposed to chronic household chaos and crowdedness display a number of maladaptive outcomes across a variety of domains (Evans & Wachs, 2010), including socio-emotional development (Berry et al., 2016), problem behaviors (Jaffee et al., 2012), cognitive development (Seidler & Ritchie, 2018), school readiness (Hur et al., 2015), and academic achievement (Hanscombe, 2011). An observation study of refugee families (Fouts et al., 2017) found that when parents reported a higher level of household crowdedness, their infants and toddlers tended to fuss and cry more often, but smiled and interacted with others less of-

ten. A study (Solari & Mare, 2012) conducted in Los Angeles, a city with atypically high levels of crowdedness, using a national representative longitudinal survey of families with children found that living in a crowded household had a negative effect on children's academic achievement, internalizing behavior, externalizing behavior, and physical health, even after controlling for family socioeconomic status (SES). Furthermore, the detrimental effect of crowdedness during childhood could persist throughout life and have long-lasting impact on the children's future well-being.

Crowded and chaotic household is especially detrimental to families since it not only affects family members' well-being, but also affects parenting quality (Gao & Wang, 2021). During the pandemic, parents are likely to experience disruptions at work, economic hardships (Gassman-Pines et al., 2020), limited access to child care, and the new challenge of helping children navigate online learning (Yoshikawa et al., 2020). Confined in a crowded household, the tension and stress at home may distract parents from actively engaging with their children and therefore interfere with their parenting sensitivity (Corapci & Wachs, 2002). How parents cope with the COVID-related stress could affect their support to their children, which facilitates the positive parent-child relationship and cultivates children's social-emotional competence (Gassman-Pines et al., 2020). Chung et al. (2020) reported that parental perceived impact of COVID was significantly associated with parent-child closeness and harsh parenting. Furthermore, the associations were mediated by parenting stress.

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COVID-related mental health issues are prevalent in families (Patrick et al., 2020; Wu et al., 2020). However, current studies predominantly focused on families with school aged children and adolescents (de Miranda et al., 2020). Due to the malleable nature of early childhood development, social-historical events such as a pandemic have cumulative and prolonged impact on young children (Yoshikawa et al., 2020). In a review of COVID-related studies on family well-being and functions, Benner and Mistry (2020) advocated that research focusing on young children should be given priority. Although household crowdedness is more prevalent among families with socioeconomic risks (Roubinov & Boyce, 2017), previous research has suggested that household condition is a distinct construct (Dumas et al., 2005) that contributes to family processes and child outcomes regardless of SES (Evans & Wachs, 2010; Pike et al., 2006). In the current study, the impact of household crowdedness on preschool-aged young children's problem behaviors was inspected in Hong Kong, one of the world's most densely populated cities. Specifically, the current study examined whether Hong Kong parents' COVID-related stress mediated the association between household crowdedness and young children's problem behaviors, controlling for the effect of family SES.

Method

Setting and participants

The average living space per person in Hong Kong's public rental housing is 13.4 square meters (144.24 square feet) as of 2020 (Hong Kong Transport and Housing Bureau, 2020). With skyrocketing housing price and shrinking living space in Hong Kong, even middle-class families living in private housing experience household crowdedness (Li, 2011). The COVID-19 outbreak worsened the overcrowded living condition when parents and children were forced to stay home with measures of social distancing including working-from-home and school and playground closure. This study was conducted between April and July 2021 when the COVID-related social distancing policies had been in effect in Hong Kong for almost one and a half year. With the vaccination rolling out, kindergartens and schools had been gradually returning to face-to-face teaching and learning since the end of February, yet still not in full capacity as of July.

A total of 228 parents of young children between 3- to 5-year-old were recruited in Hong Kong through social media, including 167 mothers (73.2%) and 61 fathers (26.8%). Participants reported both parents' education levels and monthly household income on ordinal scales. Out of the 228 families, 71.6% of the mothers and 86.4% of the fathers had post-secondary education, and the median statistic of monthly household income was within the range of HKD30,000 to HKD 50,000. The medium household income in the current sample essentially matched that in the 2020 census data (Hong Kong Census and Statistics Department, 2020), ranging from HKD34,500 for a 3-person household to HKD 47,200 for a 6-person or above household. Meanwhile, the poverty line ranged from HKD16,600 for a 3-people household to HKD23,000 for a 6-person household. The income-to-needs ratio (Assari, 2018) was calculated using the median value of each category of the household income divided by the poverty line. Result showed 26.8% of the families were considered as poor with an income-to-needs ratio lower than 1.

Procedures and measures

Procedures were reviewed and approved by the Human Research Ethics Committee of the local university. Informed consents were obtained from each participating parent. Parents finished a set of English and Chinese bilingual questionnaires measuring their COVID-related stress and their children's problem behaviors in addition to household demographics including SES and living condition in a Google form within 15 minutes. The Chinese translations of the questionnaires adopted a collaborative and iterative approach (Douglas & Craig, 2007),

where a panel of bilingual psychologists and post-graduate psychology students discussed and agreed on the translations.

Family socioeconomic status (SES). Both parents' education levels and income-to-needs ratio were standardized and summed to create an indicator of family SES. SES as a significant covariate was controlled in the statistical analyses.

Housing. Parent reported the size of family flat in square feet and the number of residents in the same household. Following Li (2011), household crowdedness was indexed as the net area of the family flat divided by the number of residents.

COVID-related stress. Parents' COVID-related stress was measured using the 30-item COVID-19 Stress Scale (CSS) (Taylor et al., 2020). The 30-item scale is composed of 5 factors, including COVID danger (e.g., "I am worried about catching the virus"), socio-economic consequences (e.g., "I am worried about grocery stores running out of food"), contamination (e.g., "I am worried that people around me will infect me with the virus"), traumatic stress (e.g., "I had trouble sleeping because I worried about the virus"), and checking of COVID information (e.g., "I check social media posts concerning COVID-19"). Parents reported on a Likert scale from 0 (not at all/never) to 4 (extremely/almost always) based on their experiences in the past three months. The internal consistencies of the 5 factors in the current sample were sufficient, with α ranging from .86 to .94. The intercorrelations among the 5 factors were high, between .673 and .900. An overall COVID-related stress score was calculated using the sum of the 5 factors. The overall internal consistency was high, $\alpha = .98$.

Child problem behaviors. The Child Behavior Checklist (CBCL 1 $\frac{1}{2}$ -5) is a parent questionnaire assessing emotional and behavior problems in 1.5-5 years old children on a 3-point scale: 0 = "not true", 1 = "somewhat or sometimes true", or 2 = "very true or often true" (Achenbach, 1999). The 19-item Aggression Behaviors subscale from CBCL 1 $\frac{1}{2}$ -5 was used to capture children's externalizing behaviors (e.g., "Can't stand waiting, wants everything now"). Children's internalizing behaviors were captured with 27 items from three subscales of CBCL 1 $\frac{1}{2}$ -5: the Anxious/Depressed subscale (e.g., "Feelings are easily hurt"), the Emotionally Reactive subscale (e.g., "Sulks a lot"), and the Withdrawn subscale (e.g., "Avoids eye contact"). The internal consistencies of the subscales in the current sample were sufficient with α ranging from .86 to .94.

Results

The analyses were conducted using IBM SPSS 24.0 and Mplus 8.1 (Muthén & Muthén, 2018). The bivariate correlations of all variables were examined, followed by a path analysis to examine the mediation effect. Model estimation was conducted using a Bayesian estimator with diffuse priors. The Bayesian method generated the empirical distributions of direct and indirect relations using Markov chain Monte Carlo methods over 10,000 iterations without any distributional assumptions (Yuan & MacKinnon, 2009). The potential scale reduction (PSR) and a visual inspection of trace plot and were used to evaluate convergence.

Descriptive statistics and bivariate correlations

Table 1 presented the descriptive statistics and bivariate correlations of all variables. The results indicated that household crowdedness, indicated by area per person, was associated with higher parents' COVID-related stress ($r = -.519, p < .001$), and higher level of child externalizing ($r = -.468, p < .001$) and internalizing problem behaviors ($r = -.341, p < .000$). Family SES was negatively correlated with COVID-related stress ($r = -.637, p < .001$), and child externalizing ($r = -.571, p < .001$) and internalizing problem behaviors ($r = -.404, p < .001$). Parents' COVID-related stress was positively correlated with child externalizing ($r = .543, p < .001$) and internalizing behaviors ($r = .390, p < .001$).

Table 1
Descriptive statistics and bivariate correlations among the main variables.

	1	2	3	4	5	6	7
1. SES	-						
2. Flat size	.594***	-					
3. Occupants	-.066	.312***	-				
4. Area per person	.638***	.864***	-.181**	-			
5. COVID-related stress	-.637***	-.390***	.224***	-.519***	-		
6. Externalizing behaviors	-.571***	-.349***	.254**	-.468***	.543***	-	
7. Internalizing behaviors	-.404***	-.316***	.058	-.341**	.390***	.826***	-
M(SD)	.00(2.73)	443.80 (188.09)	4.26 (.85)	105.90 (40.63)	58.38 (28.45)	9.76 (7.67)	7.83 (7.73)
Range	-5.34-4.24	150-1100	3-8	33.33-275.00	17-120	0-38	0-40
Skewness	-.493	1.388	.876	.922	.173	.651	1.291
Kurtosis	-.978	1.581	2.698	1.463	-.135	-.306	1.523

Note. SES = Socioeconomic status.

** $p < .01$.

*** $p < .001$ $N = 228$.

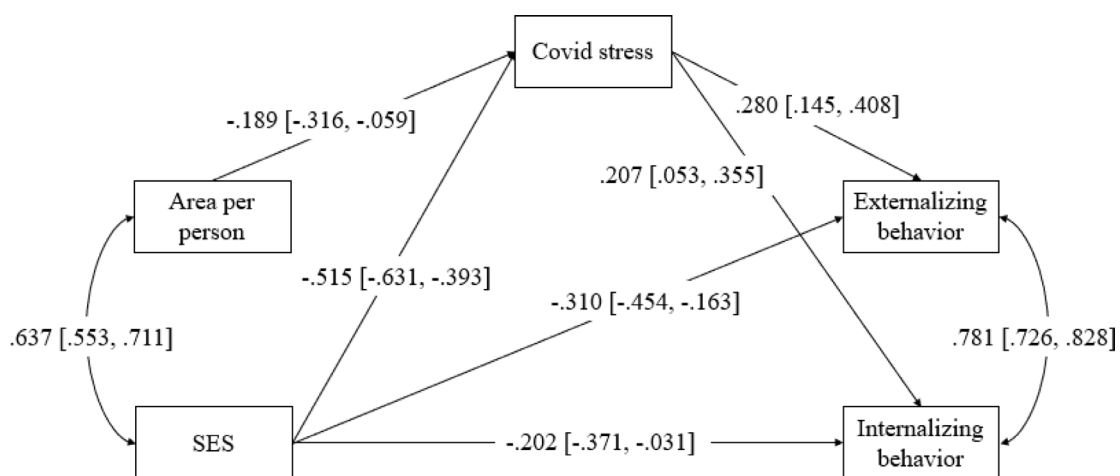


Fig. 1. Mediation models testing the direct and indirect associations between household crowdedness indicated with area per person and children’s problem behaviors via COVID-related stress.

Note. SES = Socioeconomic status.

Non-significant paths were not shown for simplicity.

Mediational analysis

Mediation analysis of Bayesian estimations with diffuse priors revealed that the hypothesized model demonstrated a good fit ($PPP = .500$, χ^2 95% CI [-16.899, 18.156]). Model convergence was supported by a final PSR value of less than 1.05. As shown in Figure 1, SES was significantly related to parents’ COVID-related stress ($\beta = -.515$, 95% CI = [-.631, -.393]). After controlling for family SES, household crowdedness, indicated with area per person, remained a significant factor in parents’ COVID-related stress ($\beta = -.189$, 95% CI = [-.316, -.059]). Parents’ COVID-related stress was significantly associated with children’s externalizing ($\beta = .280$, 95% CI = [.145, .408]) and internalizing behaviors ($\beta = .207$, 95% CI = [.053, .355]). Family SES directly predicted children’s externalizing ($\beta = -.310$, 95% CI = [-.454, -.163]) and internalizing behaviors ($\beta = -.202$, 95% CI = [-.371, -.031]). Household crowdedness did not predict either externalizing ($\beta = -.122$, 95% CI = [-.256, .015]) or internalizing behaviors ($\beta = -.100$, 95% CI = [-.254, .059]) directly. However, parents’ COVID-related stress mediated the association between household crowdedness and children’s externalizing behaviors, with an unstandardized estimation of -.010 and 95% CI of [-.020, -.003], and that between household crowdedness and children’s internalizing behaviors, with an unstandardized estimation of -.407 and 95% CI of [-.641, -.199].

Discussion

Taking an ecological systems perspective (Ackerman & Brown, 2010; Bronfenbrenner, 1994; Luster & Okagaki, 2006), this study examined how household crowdedness influenced young children’s problem behaviors and parental stress during the COVID-related social distancing when families were confined in homes. It revealed that household crowdedness was indeed predictive of parents’ COVID-related stress. Most importantly, parents’ COVID-related stress significantly mediated the associations between household crowdedness and children’s internalizing and externalizing behaviors, controlling for family SES.

Living condition as part of families’ ecological systems

The current study contributed to our understanding of the living condition as part of families’ ecological systems. A family is a complex and integrated system where individual members and subsystems reciprocally influence each other. Most of the previous research focused on interrelations within subsystems such as the marital relationship, co-parenting, or the parent-child relationship (Taraban & Shaw, 2018). It is important to realize that the physical environment in which a family lives also has an impact on family members’ behaviors and well-being. Building on previous research demonstrating that the physical

environment accounts for unique predictive variances in early development even after controlling for variances associated with the social environment (Wachs, 1990), the current study demonstrated that the living condition not only contributed to both parents' and children's well-being, but also exerted indirect impact on child problem behaviors.

The COVID pandemic is a stressful time for everyone. However, living in a crowded household for an extended period of time while dealing with the COVID-related challenges and uncertainties could adversely affect parents' judgment, compromise marital relationships, and lead to negative parenting (De Miranda et al., 2020; Gassman-Pines et al., 2020), which in turn affects child behavior. Family home is the most important proximate living context for children before school entry. Adding to Chung et al.'s (2020) study showing that parental concerns over COVID affected parent-child closeness and harsh parenting via parenting stress, the current study highlighted the role of physical living condition in shaping parents' COVID-related stress, and more importantly, its role in children's problem behaviors indirectly through parental stress.

Living condition beyond SES

Another contribution of the current findings was to demonstrate that the physical living condition had adverse effects on family functioning and child behaviors above and beyond family SES. It was no surprise that family SES predicted parents' COVID-related stress and children's problem behaviors, since it has been well-documented that socioeconomic adversity has a strong impact on family processes and child developmental outcomes (e.g., Hosokawa & Katsura, 2017; Roubinov & Boyce, 2017). However, the fact that the model was significant after controlling for family SES indicated that household crowdedness was a construct related yet distinctive from family SES in the family ecological systems. This finding was consistent with previous reports (Pike et al., 2006; Solari & Mare, 2012) on the physical environments' unique contribution to children's problem behaviors.

As one of the world's most densely populated cities, Hong Kong's over-crowdedness is somewhat independent of family incomes and education levels. A wide range of socioeconomic backgrounds was represented in the current sample, with the medium household income matching that in the census data (Hong Kong Census and Statistics Department, 2020). However, the average housing area per person in the current sample was a mere 105.90 square feet, or 9.84 square meters, lower than the 144.24 square feet in public rental housing reported by the Hong Kong Transport and Housing Bureau (2020). The discrepancy might be attributed to the fact that we calculated the area per person taking into consideration of all residents living in the same household, including extended family members and live-in domestic helpers, which made it a more accurate indicator of household crowdedness. Similar to Li's (2011) finding that large families do not necessarily foster children's good behaviors in a Hong Kong context, children in the current study showed more externalizing behaviors in large families. It seems that the crowdedness and high traffic in the home were indeed detrimental to Hong Kong families and children.

Policy implications

A survey conducted in 143 countries between February and May 2021 reported that schools worldwide were fully closed for 79 instruction days on average in 2020, which roughly account for 40% of total school days across OECD and G20 countries. As of 1 February of 2021, schools in 21% of the surveyed countries remained fully closed (United Nations, June 2021). Meanwhile, studies around the world have reported that COVID-19 infection in children is less severe (Ibrahim et al., 2020; Kanthimathinathan et al., 2020; Lin et al., 2020). On the contrary, the impact of the pandemic and social distancing on

children's social emotional development and mental health is more worrying. A systematic review of more than 80 studies involving 51,576 children and young adults (Loades et al., 2020) reported that social isolation and loneliness increased the risk of depression and anxiety in children with moderate to large effect sizes. Specifically, duration of loneliness predicted mental health symptoms more strongly than the intensity of loneliness. Juggling between working-from-home and childcare during school closure, parents experience elevated stress too (Patrick et al., 2020; Wu et al., 2020). The current study further highlighted how confinement in crowded homes affected parents' and young children's well-being.

The United Nations (13 July 2021) recently called for reopening schools to avoid a "generational catastrophe", citing children's "academic achievement and societal engagement as well as physical and mental health" are at risk, with the youngest children and those lack of resources most affected. Most of the kindergartens in Hong Kong adopted online learning during school closure. However, due to the lack of human interaction and social engagement, the effectiveness of online learning for 3- to 5-year-old young children is under scrutiny (Bassok et al., 2021). The decision of school closure should be taken with caution, with greater support to families and children to enhance resilience (Masten & Naraya, 2012; Prime et al., 2020).

Limitations and future directions

Due to the measures of social distancing, this study relied exclusively on parents' self-report via the internet. In-home observational study and behavioral measures of parenting and children's problem behaviors would provide a more comprehensive picture of the phenomenon. The current data did not include any information on the residents' age and gender, which most likely affect the living arrangement and the level of crowdedness in the household. Future research should take these factors into consideration. Furthermore, longitudinal follow-ups are needed to fully understand the long-term impact of the COVID pandemic on family functioning and child outcomes.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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