



Associations of Socio-demographic, Family, and Neighborhood Factors with Physical Activity-Related Parenting Practices Among Hong Kong Preschoolers' Parents

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Published online: 2 January 2019

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Abstract

Objectives Regular engagement in physical activity (PA) has numerous health benefits in young children. Young children's parents can influence their children's PA behavior through different PA-related parenting practices. This cross-sectional study examined the independent contributions of socio-demographic, family/home and parent-perceived neighborhood environmental characteristics explaining PA-related parenting practices encouraging or discouraging PA among Hong Kong preschool-aged children (3–5 years-old). **Methods** Hong Kong Chinese preschoolers' parents were recruited from pre-selected kindergartens and Maternal and Child Health Centers located in areas stratified by residential density and socio-economic status. They self-completed socio-demographic, family/home and perceived neighborhood characteristics and PA-related parenting practices questionnaires. Generalized linear models were used to examine associations of socio-demographic, family/home and neighborhood variables with PA-related parenting practices. **Results** Socio-demographic and family/home characteristics were significantly correlated with parenting practices encouraging and discouraging PA. Parent-perceived neighborhood characteristics were significantly correlated with parenting practices discouraging PA only. **Conclusions for Practice** This study identified correlates of PA-related parenting practices among parents of Hong Kong Chinese preschoolers. The findings suggest future PA-promoting interventions among Chinese preschoolers via the promotion of parenting practices encouraging children's PA should consider multiple factors, including family relationships and childcare sharing, promotion of PA and its benefits among parents, and neighborhood social cohesion, traffic safety and safety from crime.

Keywords Chinese · Parenting practices · Neighborhood environment · Family · Socio-demographics

Significance

What is Already Known on this Subject?

Environmental and social correlates of parenting practices that encourage and discourage young children's physical activity have been somewhat examined in a Western context but not an Asian context.

What this Study Adds?

Socio-demographic and family/home characteristics were associated with both parenting practices encouraging and discouraging Hong Kong Chinese preschoolers' physical activity, while parent-perceived neighborhood environment factors were associated with parenting practices discouraging physical activity only. Multiple family/home and neighborhood factors need to be considered to increase Hong

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Kong Chinese young children's PA via the promotion of PA-related parenting practices.

Introduction

Preschool-aged children spend most of their time with their parents, who exert a strong influence on their behaviors, including physical activity (PA). Studies have shown that PA in early childhood relates to parenting practices encouraging or discouraging engagement in PA (Cerin et al. 2016; Pocock et al. 2010; Tucker et al. 2011). For example, providing children with outdoor toys was positively related to PA in Latino preschoolers (O'Connor et al. 2014a).

Parenting practices are parental behaviors or actions that are goal oriented and aimed at attaining desired outcomes (Darling and Steinberg 1993). They are influenced by culture and likely to differ across geographical regions and ethnic groups (O'Connor et al. 2014a; Suen et al. 2015b). Thus, it is important to study parenting practices that influence young children's PA within specific cultural and geographical contexts. Parenting practices in Hong Kong need to be considered from Hong Kong's cultural context which emphasizes academic achievement and, thus, leads to the prioritization of children's academic performance over extra-curriculum activities, such as PA, and encourages parents to also focus on their own education and career (Ha et al. 2010). These parental attitudes and practices result in Hong Kong young children tending to be physically inactive (Ha et al. 2010). Although the Hong Kong Department of Health recommends that preschool-aged children accumulate 1.5 h of PA daily (Department of Health, Hong Kong SAR 2018), a territory-wide survey found that only 18% of them accrued one or more hours of outdoor PA per day (Community Sports Committee of the Sports Commission 2013). To devise programs for the promotion of parenting practices that encourage PA in Hong Kong children, it is important to understand their potential determinants.

From a socio-ecological perspective, PA-related parenting practices are influenced by multiple social and environmental factors (O'Connor et al. 2014b). Significant associations were found between parent-perceived neighborhood environmental attributes and PA-related parenting practices among American Latino parents (O'Connor et al. 2014b). Along with neighborhood characteristics, it is plausible to expect that individual- and family-level factors will be correlates of PA-related parenting practices. For example, parents who enjoy and engage in PA are more likely to employ practices encouraging their children's participation in PA (Trost et al. 2003). While the evidence about the effects of household composition on PA-related parenting practices is conflicting (Irwin et al. 2005; O'Connor et al. 2014b; Suen et al. 2015b), having a larger extended family was associated with

a higher level of family support (Keefe et al. 1979), which may help the implementation of practices encouraging PA. Household socio-economic status (SES) was found to be correlated with PA-related parenting practices and children's opportunities to participate in PA (O'Connor et al. 2014a).

Socio-ecological correlates of parenting practices that encourage and discourage children's PA have been examined in a few Western studies (Gubbels et al. 2011; Lampard et al. 2013; O'Connor et al. 2014b), but not in Asian context, such as Hong Kong. The Chinese version of familism, a social structure where family interests take precedence over those of the individual, is still prevalent in Hong Kong (Leung 2017). As familism is associated with high levels of mutual support and interdependence in the completion of daily activities (Leung 2017), it may influence PA-related parenting practices. In addition to familism and the aforementioned emphasis on education, other Hong Kong demographics may also influence PA-related parenting practices. Potential negative influences include traffic density, traffic-related air and noise pollution, summer heat and humidity and small apartments. While there is no information on average apartment size in Hong Kong, in 2017 there were 769,352 public rental housing flats with an authorized population of 2,094,473 and an average living space of 37 m² (Hong Kong Housing Authority 2017). This living space is unlikely to be conducive to preschoolers' indoor PA. The high level of safety from crime is likely to encourage parents to venture outside with young children. Hong Kong is a very dense city and Kwung Tong District the densest, with 59,400 people per km² in 2017 (Census and Statistics Department 2017). Density may have benefits such as close access to facilities for PA and other places to walk to with preschoolers, but also disadvantages such as crowdedness.

Given the current dearth of information, it is pertinent to gather scientific evidence on the potential determinants of parenting practices related to Chinese preschoolers' PA. This knowledge would help identify families with children at high-risk of developing an inactive lifestyle, and inform the planning of future interventions and policies promoting parenting practices that encourage children's participation in PA. This study aimed to examine the independent contributions of socio-demographics, family/home characteristics, and parent-perceived neighborhood environmental attributes to the explanation of PA-related parenting practices that encourage or discourage PA among Hong Kong preschool-aged children. In line with socio-ecological models of parental behavior (O'Connor et al. 2014b), we hypothesized that each set of factors would independently contribute to the explanation of PA-related parenting practices.

Methods

We conducted a cross-sectional study of Chinese-speaking parents of Hong Kong preschoolers from September 2011 to April 2014. The study was approved by the Ethics Committee of the leading institution and was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. Participant recruitment was stratified by area-level SES and population density to maximize variability in these neighborhood characteristics, which might influence the type and levels of parenting practices (O'Connor et al. 2014a; Suen et al. 2015b). Area-level SES and population density estimates were based on Census data on Tertiary Planning Units (TPUs), which are the smallest administrative area units in Hong Kong with Census data. TPUs were classified into low-to-medium SES or medium-to-high SES based on the median split of monthly domestic income at HK\$24,500. Areas with a population density ≤ 9000 and > 9000 residents/km² were classified as high-density and low-density areas, respectively. Thus, each TPU block was classified into four strata as low-to-medium SES/high density (LSES/HD); low-to-medium SES/low density (LSES/LD); moderate-to-high SES/high density (HSES/HD); or moderate-to-high SES/low density (HSES/LD). The original plan was to recruit about 100 parents from each stratum. However, the actual recruitment from the medium-to-high SES areas was more difficult. The final sample by stratum consisted of 57 (14%; HSES/LD), 67 (16%; HSES/HD), 165 (40%; LSES/LD) and 122 (30%; LSES/HD) parents.

Participants

We recruited a total of 411 parents (79.8% female; mean age 37.2 years; 56.9% male child) from kindergartens and Maternal and Child Health Centers in Hong Kong using convenience sampling. With 411 participants, we were powered to detect a small effect size equivalent to ~ 2% of explained variance in the outcome. A research assistant approached potential participants at kindergartens and Maternal and Child Health Centers located in pre-selected areas of Hong Kong with the assistance of local staff. Participants received a voucher valued at HK\$ 50 as a token of appreciation for their time and contribution to the project. Parents or primary caregivers (herein referred to as parents) of at least one 3–5 year-old Chinese-speaking child living in Hong Kong were included unless they were unable to read and write in Chinese or their children had a disease affecting their PA behavior. Eligible parents who agreed to join the study and provided written informed consent completed a socio-demographic

survey and a set of questionnaires that assessed PA-related parenting practices, perceptions of neighborhood physical and social characteristics and family/home-related factors. Completed surveys were collected at the recruitment sites or mailed back to research staff using pre-paid envelopes.

Measures

Outcome measures were PA-related parenting practices encouraging and discouraging child's PA, while explanatory variables (correlates) were the respondents' (parents of a preschool-aged child) socio-demographic and family-home characteristics, and parent-perceived neighborhood environmental factors. All measures are described in Table 1, including, as applicable, name of instrument, source (published paper on development and/or psychometric characteristics in the target population of Hong Kong parents), response scale, internal consistency (Cronbach's alpha), and test–retest reliability.

Data Analyses

Data entry was verified by two members of the research team. Over 96% of surveys had no missing data. We contacted the remaining 15 participants with missing data (3 to 5 items), who provided the missing information.

Descriptive statistics were computed for each variable, as appropriate. Namely, frequencies and percentages were provided for categorical variables, while mean (standard deviation; SD) and median (interquartile range; IQR) values were computed for continuous and discrete count variables. To examine associations of socio-demographic, family/home and neighborhood characteristics with PA-related parenting practices, generalized linear regression models (GLMs) with robust standard errors accounting for clustering effects at the neighborhood level (i.e., participants living in the same TPU) were used. Separate models were constructed for each dimension of parenting practice (two encouraging and four discouraging). The first set of models included parent/child socio-demographics and family/home characteristics. As perceived environmental safety variables may mediate the associations of neighborhood social cohesion, informal social control and signs of physical and social disorder with PA-related parenting practices, a second set of models examined the associations of the former set of variables (e.g., neighborhood social cohesion) and availability of places and equipment for PA with the parenting practice outcome variables, adjusting for the variables in the first set of GLMs. Finally, we added perceived environmental safety variables to the third set of models. A Gaussian variance and an identity link functions were used as all outcome variables were approximately normal distributed. A two-tailed probability

Table 1 List of measures and their characteristics

Measures (source) [# of items]	“Instructions to respondents” and response scale	Cronbach’s alpha	Test–retest reliability
Outcome measures: physical activity (PA)-related parenting practices			
Physical Activity Parental Practices for Preschoolers—Hong Kong (PAPPP-HK) (Suen et al. 2017)	“How often do you ...” 5-point frequency scale (1 = rarely; 5 = frequently)		
Practices that encourage child’s PA subscales			
Participatory engagement in PA, modelling and structure		0.89	0.77
Provision of appropriate places for child’s PA		0.68	0.65
Practices that discourage child’s PA subscales			
Safety concerns/overprotection		0.79	0.66
Psychological/behavioral control		0.64	0.66
Promoting inactivity		0.63	0.82
Promoting screen time		0.71	0.58
Correlates			
Socio-demographic characteristics			
Child’s sex	Female; male	NA	NA
Child’s age	Years	NA	NA
Parent’s (respondent’s) age	Years	NA	NA
Parent’s (respondent’s) working status	“Do you work?” No; part-time; full-time	NA	NA
Parent’s (respondent’s) educational attainment	Primary; Junior secondary; Senior secondary; Associate degree/higher diploma; Undergraduate; Postgraduate	NA	NA
Household income bracket	“Approximate average monthly household income before taxes” Ten income brackets	NA	NA
Size of unit/house/apartment (in square feet)	100–299; 300–599; 600–899- 900–1199; 1200+	NA	NA
Family and home characteristics			
Availability of passive-play equipment (Joe et al. 2008; Suen et al. 2015a)	“For the following electronic devices, please count the total number available in your home that work ...” 0; 1; 2; 3; 3+	NA	0.93
Familism (Gaines et al. 1997; Gil et al. 2000; translated and piloted in Chinese parents)	“How much do you agree or disagree with the statements?” 5-point Likert scale (1 = strongly disagree; 5 = strongly agree)	0.72	0.57
Parental PA: Chinese version of International physical activity questionnaire—short last 7-days (Macfarlane et al. 2007)	“During the last 7 days, ...” Weekly minutes of PA	NA	0.79
Parental enjoyment of PA (Troost et al. 2003; translated and piloted in Chinese parents)	“Please select the answer that best applies ...” 5-point Likert scale (1 = strongly disagree; 5 = strongly agree)	0.70	0.54
Parental and martial roles—China Housing Survey (Ji and Norling 2004)			
Role of family members			
No. of child-care activities (undertaken by respondent)	“For each of the following activities, please tell us whether you, your spouse/partner and/or other family members do them”	NA	0.57
No. of child-care activities (undertaken by others)	Count of activities	NA	0.59
No. of other household activities (undertaken by respondent)		NA	0.69
No. of other household activities (undertaken by others)		NA	0.72
Satisfaction with family life	“How satisfied are you with the following?” 5-point scale (1 = very unsatisfied; 5 = very satisfied)	0.92	0.51
Family/household structure—China Housing Survey (Ji and Norling 2004)			

Table 1 (continued)

Measures (source) [# of items]	“Instructions to respondents” and response scale	Cronbach’s alpha	Test–retest reliability
Nuclear family	“Besides your spouse/partner (if applicable), who is currently living with you?” Count or presence	NA	0.69
No. of adult family members		NA	0.44
No. of children (< 18 years)		NA	0.72
Domestic helper (presence)		NA	0.53
Extended family (no. of members)		“Please provide information about your relatives who are not currently living with you” Count	
Perceived neighborhood environmental factors			
PA-related informal social control (Cerin et al. 2017; Suen et al. 2014)	“Choose the best answer that describes people in your neighborhood. How much do you agree or disagree with the following statements” 5-point Likert scale (1 = strongly disagree; 5 = strongly agree)	0.89	0.77
General informal supervision		0.87	0.81
Civil engagement for the creation of a better neighborhood environment	“How much do you agree or disagree with the following statements?” 5-point Likert scale (1 = strongly disagree; 5 = strongly agree)	0.82	0.61
Educating and assisting neighborhood children		0.72	0.67
Neighborhood community cohesion (Suen et al. 2015a)	“How often do you see the following in your neighborhood?” 5-point frequency scale (1 = never; 5 = frequently)	0.90	0.60
Signs of physical and social disorder (Suen et al. 2015a)		0.81	0.51
Risk of unintentional injury (Suen et al. 2015a)	“How much do you agree or disagree with the following statements?” 4-point Likert scale (1 = strongly disagree; 5 = strongly agree)	0.73	0.68
Traffic safety and pedestrian infrastructure (Suen et al. 2015a)		NA	0.45
Traffic hazards	“How much do you agree or disagree with the following statements?” 4-point Likert scale (1 = strongly disagree; 5 = strongly agree)	NA	0.55
Not many cul-de-sacs		0.87	0.69
Strip of grass/dirt between street and footpaths	“How much do you agree or disagree with the following statements?” 4-point Likert scale (1 = strongly disagree; 5 = strongly agree)	NA	0.62
Stranger danger in the neighborhood (Suen et al. 2015a)		NA	0.82
Availability of active-play equipment (Suen et al. 2015a)	“Please indicate whether the following is available to your 3–5 year old child” Response: At home [3 points]; In the neighborhood [2 points]; Outside the neighborhood [1 point]		
Availability of places for children’s PA (Suen et al. 2015a)	“Please indicate whether the following is available to your 3–5 year old child in your neighborhood” Response: yes; No		

PA physical activity, NA not applicable (because single item or checklist/index)

level of 0.05 was adopted. We examined models for multicollinear predictors and models that showed a high level of overlapping in variance (> 50%) were excluded from the models (here “the number of others helping with childcare activities” and “the number of other household activities undertaken by others”). As the associations of neighborhood social cohesion, informal social control and signs of physical and social disorder (second sets of GLMs) with

parenting practices did not significantly change after the inclusion of perceived neighborhood safety variables, only the results of the fully-adjusted models are reported (third set of GLMs). Analysis was undertaken using Stata 10.

Results

Parenting practices encouraging PA were more frequently used than practices discouraging PA (scores on 5-point frequency scales: 3.4–3.6 vs. 2.0–2.2) (Table 2). Parents reported that they enjoyed participating in PA and engaged in higher levels of activity (median = 257 min/week) than the PA guidelines for health for adults of 150 min/week.

Nearly all socio-demographic and family/home characteristics, except for household income, the number of adults in the household, the presence of a domestic helper and the number of members of the extended family, were significantly associated with one or more PA-related parenting practices (Table 3). Among these factors, the strongest predictors of practices encouraging child's PA were parental education (positive association), parental enjoyment of PA (positively associated with participatory engagement in PA), and parental PA (positively associated with participatory engagement in PA, but negatively associated with the provision of places for child's PA). With respect to parenting practices discouraging child's PA, factors that showed stronger or more consistent positive associations were availability of passive-play equipment at home and number of children in the household. Main negative correlates of parenting practices discouraging child's PA were number of childcare activities undertaken by other household members, not working, and the respondent being a female. Child's age was positively related to psychological/behavioral control, but negatively related to promoting inactivity (Table 3).

No significant associations were observed between perceived neighborhood environment factors and parenting practices encouraging child's PA. In contrast, several significant associations were observed with parenting practices discouraging child's PA. Specifically, perceived signs of physical and social disorder were positively related to three of four dimensions of parenting practices discouraging PA. Traffic hazards were positively associated with parenting practices related to safety concerns and overprotection. The presence of strips of grass/dirt between streets and footpaths was negatively associated with parental promotion of screen time in children, while neighborhood community cohesion was negatively associated with the promotion of inactivity. The availability of equipment and places for children's PA in the neighborhood, perceived stranger danger, risk of unintentional injury, and PA-related informal social control did not contribute to the explanation of parenting practices discouraging child's PA (Table 4).

Discussion

The purpose of this study was to examine the independent contributions of socio-demographic, family/home characteristics and parent-perceived neighborhood environmental attributes to the explanation of PA-related parenting

Table 2 Characteristics of the study sample (N = 411)

Characteristics	N (%)
Child characteristics	
Sex, female, n%	177 (43.1)
Age (years), mean (SD)	4.2 (0.7)
Parent (respondent) characteristics	
Age (years), mean (SD)	37.2 (5.8)
Sex	
Male	83 (20.2)
Female	328 (79.8)
Education attainment	
Junior secondary (form 5 or below)	162 (39.4)
Senior secondary (form 6 and 7)	51 (12.4)
Associate degree or higher diploma	44 (10.7)
Undergraduate degree	119 (29.0)
Postgraduate degree	35 (8.5)
Working (full-time or part-time)	
No	153 (37.2)
Yes	258 (62.8)
Family characteristics	
# adults (19 years or older) in the household	
1	44 (10.7)
2	187 (45.5)
3 or more	180 (43.8)
# children (18 years or younger) in the household	
1	162 (39.4)
2	217 (52.8)
3 or more	32 (7.8)
Highest education attainment	
Junior secondary (form 5 or below)	129 (42.2)
Senior secondary (form 6 and 7)	55 (13.4)
Associate degree or higher diploma	47 (11.4)
Undergraduate degree	121 (29.4)
Postgraduate degree	59 (14.4)
Average monthly income (HK\$) (US\$1 = HK\$7.8)	
< \$15,000	73 (17.8)
\$15,000–\$25,000	93 (22.6)
\$25,000–\$40,000	82 (19.7)
> \$40,000	163 (39.9)
Unit/house/apartment size (sqf.)	
100–299	20 (4.9)
300–599	173 (42.1)
600–899	158 (38.4)
900–1199	36 (8.8)
1200 or above	24 (5.8)

number, *sqf* square feet

practices relevant to Hong Kong preschool-aged children. We found different patterns of correlates for parenting practices encouraging and discouraging preschoolers' PA.

Table 3 Descriptive statistics of parenting practice variables, family and home characteristics and perceived neighborhood environmental attributes

Variable (theoretical range of scale)	M (SD)	Median (IQR)
Physical activity-related parenting practices		
Practices that encourage child's PA		
Participatory engagement in PA, modeling and structure (1–5)	3.4 (0.6)	3.4 (0.7)
Provision of appropriate places for child's PA (1–5)	3.6 (0.8)	3.8 (1.0)
Practices that discourage child's PA		
Safety concerns/overprotection (1–5)	2.2 (0.7)	2.2 (1.0)
Psychological/behavioral control (1–5)	2.1 (0.7)	2.0 (0.8)
Promoting inactivity (1–5)	2.0 (0.8)	2.0 (1.0)
Promoting screen time (1–5)	2.2 (0.8)	2.0 (1.5)
Family/home characteristics		
Availability of passive-play equipment (0–28)	4.8 (2.8)	4.0 (3.0)
Familism (1–5)	4.1 (0.6)	4.0 (0.8)
Physical activity of parent/caregiver (IPAQ – Short) – Total min/week	483 (867)	257 (450)
Parental enjoyment of PA (1–5)	3.5 (0.8)	3.5 (1.0)
Parental and marital roles		
Role of family members		
# childcare activities undertaken by respondent (0–3)	2.7 (0.7)	3.0 (0.0)
# childcare activities undertaken by others (0–3)	1.3 (1.6)	2.0 (3.0)
# others helping with childcare activities (0–5)	1.0 (0.8)	1.0 (1.3)
# other household activities undertaken by respondent (0–7)	3.7 (1.8)	4.0 (3.0)
# other household activities undertaken by others (0–7)	4.3 (2.1)	5.0 (4.0)
Satisfaction with family life (1–5)	3.8 (0.5)	3.9 (0.5)
Family/household structure		
Nuclear family		
# adult family members (1–5)	2.4 (1.2)	2.0 (1.0)
# children (< 18 years) (1–5)	1.7 (0.7)	2.0 (1.0)
% of households with domestic helper	22.5 (41.8)	0.0 (0.0)
Extended family (size)	3.1 (2.0)	3.0 (3.0)
Perceived neighborhood environmental factors		
Neighborhood community cohesion (1–5)	3.5 (0.5)	3.6 (0.6)
PA-related informal social control		
General informal supervision (1–5)	2.6 (0.8)	3.0 (1.0)
Civil engagement for the creation of a better neighborhood environment (1–5)	3.5 (0.6)	3.4 (0.7)
Educating and assisting neighborhood children (1–5)	3.8 (0.5)	3.9 (0.6)
Signs of physical and social disorder (1–5)	1.9 (0.6)	1.9 (0.8)
Risk of unintentional injury (1–4)	2.5 (0.8)	2.4 (1.2)
Traffic safety and pedestrian infrastructure		
Traffic hazards (1–4)	2.4 (0.5)	2.5 (0.8)
Not many cul-de-sacs (1–4)	2.9 (0.8)	3.0 (1.0)
Strip of grass/dirt between street and footpaths (1–4)	2.3 (0.9)	2.0 (1.0)
Stranger danger in the neighborhood (1–4)	2.8 (1.0)	3.0 (1.0)
Availability of active-play equipment (8–24)	16.6 (3.5)	16.0 (5.0)
Availability of places for children's PA (0–11)	6.2 (2.4)	6.0 (3.0)

M mean, *SD* standard deviation, *IQR* interquartile range, # number, *PA* physical activity

Correlates of parenting practices encouraging child's PA fell mainly within the categories of socio-demographic and family/home characteristics. Younger parents reported

parenting practices using participatory engagement, modeling and structure more frequently than their older counterparts. However, this effect did not extend to the provision of

Table 4 Associations (regression coefficients and 95% confidence intervals) of socio-demographic, family, home and perceived neighborhood environmental characteristics with physical activity-related parenting practices of Chinese parents of Hong Kong preschool-aged children

Correlates	Physical activity (PA)-related parenting practices					
	Practices that encourage child's PA		Practices that discourage child's PA			
	Participatory engagement in PA, modeling and structure	Provision of places for child's PA	Safety concerns/overprotection	Psychological/behavioral control	Promoting inactivity	Promoting screen time
Socio-demographic characteristics						
Child's sex (ref: male): female	0.01 (-0.09, 0.11)	-0.08 (-0.23, 0.07)	0.16 (0.04, 0.29)*	0.06 (-0.07, 0.18)	0.05 (-0.08, 0.17)	0.04 (-0.11, 0.19)
Child's age	0.02 (-0.05, 0.09)	0.08 (-0.01, 0.16)	0.04 (-0.06, 0.15)	0.16 (0.08, 0.23)***	-0.17 (-0.26, -0.08)***	0.01 (-0.08, 0.09)
Parent's sex (ref: male): female	-0.11 (-0.26, 0.04)	-0.01 (-0.20, 0.17)	-0.15 (-0.34, 0.05)	-0.23 (-0.36, -0.10)**	-0.32 (-0.51, -0.13)***	-0.34 (-0.55, -0.13)**
Parent age	-0.01 (-0.02, -0.01)*	0.01 (-0.01, 0.03)	0.01 (-0.01, 0.02)	0.00 (-0.01, 0.01)	-0.01 (-0.02, 0.01)	-0.01 (-0.02, -0.01)**
Working (ref: yes): no	-0.04 (-0.18, 0.09)	-0.02 (-0.23, 0.18)	-0.25 (-0.43, -0.07)**	-0.10 (-0.21, 0.01)	-0.31 (-0.48, -0.14)***	-0.08 (-0.25, 0.18)
Household income bracket	-0.01 (-0.03, 0.03)	0.00 (-0.04, 0.04)	0.00 (-0.04, 0.03)	-0.01 (-0.04, 0.03)	-0.02 (-0.06, 0.02)	0.02 (-0.02, 0.07)
Parent's education (ref: junior secondary)						
Senior secondary/associate degree or higher diploma	0.20 (0.09, 0.32)***	0.26 (0.01, 0.81)*	-0.07 (-0.23, 0.10)	-0.12 (-0.26, 0.02)	0.05 (-0.14, 0.24)	-0.02 (-0.22, 0.18)
Tertiary	0.16 (0.01, 0.31)*	0.14 (-0.09, 0.38)	-0.11 (-0.32, 0.11)	-0.07 (-0.24, 0.10)	0.05 (-0.15, 0.24)	-0.10 (-0.35, 0.15)
Size of unit/home/apartment (per 100 sqf.)	0.01 (-0.01, 0.01)	0.00 (-0.01, 0.02)	0.01 (-0.01, 0.03)	0.00 (-0.01, 0.01)	0.03 (0.00, 0.06)*	0.00 (-0.02, 0.07)
Family/home characteristics						
Availability of passive—play equipment	0.00 (-0.01, 0.01)	0.01 (-0.02, 0.03)	0.04 (0.02, 0.07)**	0.02 (-0.00, 0.03)	0.02 (-0.00, 0.05)	0.07 (0.03, 0.10)***
Familism						
Parents' PA (per 1000 min/week)	0.10 (-0.01, 0.20)	0.18 (0.02, 0.34)*	-0.06 (-0.20, 0.07)	-0.01 (-0.16, 0.11)	-0.01 (-0.18, 0.15)	0.04 (-0.10, 0.19)
Parental enjoyment of PA	0.09 (0.01, 0.10)*	-0.11 (-0.20, -0.02)**	-0.03 (-0.10, 0.03)	-0.09 (-0.10, -0.02)*	-0.04 (-0.10, 0.00)	-0.04 (-0.09, 0.01)
Parental and marital roles	0.21 (0.15, 0.27)***	0.07 (-0.03, 0.16)	-0.01 (-0.12, 0.10)	0.02 (-0.07, 0.11)	0.02 (-0.07, 0.11)	-0.12 (-0.21, -0.02)*
Role of family members						

Table 4 (continued)

Correlates	Physical activity (PA)-related parenting practices					
	Practices that encourage child's PA		Practices that discourage child's PA			
	Participatory engagement in PA, modeling and structure	Provision of places for child's PA	Safety concerns/overprotection	Psychological/behavioral control		
# childcare activities undertaken by respondent	0.04 (−0.06, 0.15)	0.16 (0.04, 0.28)*	−0.05 (−0.12, 0.02)	−0.02 (−0.11, 0.07)	0.02 (−0.08, 0.12)	−0.06 (−0.18, 0.06)
# childcare activities undertaken by others	−0.01 (−0.04, 0.03)	0.00 (−0.09, 0.08)	−0.01 (−0.05, 0.04)	−0.01 (−0.06, 0.03)	−0.07 (−0.13, −0.01)*	−0.09 (−0.14, −0.03)**
# other household activities undertaken by respondent	0.01 (−0.02, 0.03)	0.02 (−0.03, 0.07)	0.01 (−0.02, 0.00)	−0.02 (−0.05, 0.01)	−0.01 (−0.06, 0.03)	0.01 (−0.04, 0.06)
Satisfaction with family life	0.01 (−0.12, 0.14)	−0.02 (−0.18, 0.13)	0.01 (−0.14, 0.17)	−0.05 (−0.16, 0.05)	−0.09 (−0.25, 0.07)	−0.17 (−0.30, −0.03)*
Family/household structure						
Nuclear family						
# adult family members in household	0.03 (−0.02, 0.07)	0.07 (−0.01, 0.08)	−0.01 (−0.08, 0.05)	−0.04 (−0.10, 0.02)	0.01 (−0.05, 0.07)	0.02 (−0.05, 0.09)
# children in household (< 18 years)	−0.04 (−0.10, 0.02)	−0.08 (−0.17, 0.01)	0.05 (−0.06, 0.16)	0.28 (0.16, 0.40)***	−0.01 (−0.13, 0.11)	−0.06 (−0.14, 0.03)
% of households with domestic helper	−0.06 (−0.21, 0.09)	0.06 (−0.11, 0.23)	−0.11 (−0.26, 0.03)	−0.08 (−0.21, 0.05)	−0.05 (−0.22, 0.13)	0.02 (−0.15, 0.20)
Extended family (# members)	0.01 (−0.03, 0.04)	0.04 (−0.01, 0.08)	−0.03 (−0.07, 0.01)	−0.02 (−0.05, 0.01)	−0.01 (−0.05, 0.03)	−0.01 (−0.05, 0.03)
Perceived neighborhood environmental factors						
Neighborhood community cohesion	0.02 (−0.14, 0.17)	0.06 (−0.12, 0.25)	0.09 (−0.06, 0.25)	0.02 (−0.10, 0.13)	−0.15 (−0.29, −0.01)*	0.04 (−0.20, 0.29)
PA-related informal social control						
General informal supervision	0.04 (−0.05, 0.14)	0.00 (−0.12, 0.11)	0.01 (−0.08, 0.10)	0.07 (−0.02, 0.17)	0.05 (−0.07, 0.17)	0.10 (−0.02, 0.21)

Table 4 (continued)

Correlates	Physical activity (PA)-related parenting practices					
	Practices that encourage child's PA			Practices that discourage child's PA		
	Participatory engagement in PA, modeling and structure	Provision of places for child's PA	Safety concerns/overprotection	Psychological/behavioral control	Promoting inactivity	Promoting screen time
Civil engagement for the creation of a better neighborhood environment	0.06 (-0.04, 0.17)	0.00 (-0.20, 0.21)	0.00 (-0.14, 0.14)	0.02 (-0.14, 0.18)	0.08 (-0.08, 0.23)	0.12 (-0.04, 0.28)
Educating and assisting neighborhood children	0.01 (-0.14, 0.16)	0.03 (-0.17, 0.23)	-0.06 (-0.20, 0.08)	0.04 (-0.11, 0.18)	-0.05 (-0.19, 0.09)	-0.06 (-0.24, 0.13)
Signs of physical and social disorder	0.08 (-0.02, 0.18)	0.12 (-0.01, 0.25)	0.26 (0.13, 0.39)***	0.19 (0.04, 0.34)*	0.10 (-0.05, 0.25)	0.25 (0.11, 0.40)***
Risk of unintentional injury	-0.03 (-0.13, 0.07)	0.06 (-0.07, 0.19)	0.02 (-0.09, 0.13)	0.02 (-0.07, 0.12)	0.02 (-0.12, 0.17)	0.09 (-0.02, 0.20)
Traffic safety and pedestrian infrastructure						
Traffic hazards	-0.09 (-0.20, 0.03)	0.06 (-0.14, 0.26)	0.17 (0.02, 0.32)*	0.01 (-0.13, 0.15)	-0.05 (-0.23, 0.12)	0.01 (-0.18, 0.19)
Not many cul-de-sacs	-0.01 (-0.08, 0.07)	0.08 (-0.01, 0.16)	-0.04 (-0.12, 0.03)	-0.01 (-0.08, 0.06)	-0.03 (-0.13, 0.06)	-0.05 (-0.13, 0.03)
Strip of grass/dirt between street and footpaths	0.02 (-0.04, 0.07)	-0.09 (-0.20, 0.01)	-0.08 (-0.16, 0.00)	-0.03 (-0.14, 0.07)	-0.04 (-0.15, 0.07)	-0.14 (-0.24, -0.03)**
Stranger danger in the neighborhood	-0.01 (-0.08, 0.08)	0.03 (-0.05, 0.11)	0.05 (-0.05, 0.14)	0.06 (-0.01, 0.14)	0.00 (-0.09, 0.09)	0.00 (-0.09, 0.08)
Availability of active-play equipment	-0.01 (-0.03, 0.01)	0.00 (-0.03, 0.04)	0.01 (-0.01, 0.03)	0.01 (-0.01, 0.03)	0.00 (-0.02, 0.02)	0.00 (-0.02, 0.02)
Availability of places for children's PA	0.00 (-0.02, 0.03)	-0.02 (-0.06, 0.01)	-0.02 (-0.05, 0.02)	-0.01 (-0.04, 0.03)	0.01 (-0.02, 0.05)	0.01 (-0.03, 0.04)

All models adjusted for clustering at the Tertiary Planning Unit level

Ref reference category; # number

*p < 0.05; **p < 0.01; ***p < 0.001

places for child's PA. Younger parents may be more physically capable of participating in PA with their children and acquire health-related information, including information on the benefits of PA, more easily through a wider range of media, such as the internet and social media channels (Duggan et al. 2015). Education was the only other socio-demographic characteristic related to parenting practices encouraging PA, showing positive associations with both subscales. Similar findings were observed in European parents (Gubbels et al. 2011). More educated parents may use more PA-encouraging parenting practices because they are more aware of the benefits of PA.

Four family/home characteristics emerged as significant correlates of parenting practices encouraging PA. Parents who had a more prominent childcare role and higher levels of familism reported taking their children to places for PA more often than their counterparts. Parents with a childcare-centered role in the family may be required (as part of their role) to take children to places where they can be active. Families with higher levels of familism possess more social support and manpower resources from the nuclear and extended family (Gil et al. 2000), which would allow them to afford the time to take children to places for PA. Higher familism is predictive of higher levels of care and respect for one another (Gil et al. 2000). Members of cohesive families may care more about the benefits and desires of their children and, thus, take them to places where they like to play. Also, members of cohesive families tend to frequently visit one another, which may provide more options of places for PA.

Parents' engagement in, and household enjoyment of, PA were positively correlated with the parenting practices of participatory engagement, modeling and structure. Previous studies found positive associations between these two parental characteristics and children's PA (Oliver et al. 2010; Ziviani et al. 2006). Parents and households who enjoy and participate in PA are more likely to engage in PA with their children and provide structured activities and opportunities for PA. Children of such households are more likely to adopt an active lifestyle as a result of modeling their parents' behavior. Parents' engagement in PA was negatively associated with the provision of appropriate places for child's PA. Physically active parents may use this type of parenting practices less often because they may encourage their child's participation in PA through participatory engagement rather than by taking them to specific places where their child is active but they are mere, passive spectators.

In this study, none of the parent-perceived neighborhood environmental attributes were related to parenting practices encouraging PA, which is in contrast to a recent study on Latino parents (O'Connor et al. 2014b). Hong Kong parents may prioritize the benefits associated with PA participation over concerns related to the suitability or safety of

their surrounding environment. They may also employ PA-promoting strategies that are less feasible than in Houston, Texas, where the study on Latino parents was conducted (O'Connor et al. 2014b). Unlike Houston, Hong Kong is a dense city with a developed and efficient public transport network (Cerin et al. 2007). Parents and their preschoolers can easily access communities outside their immediate neighborhood that provide a suitable environment for PA.

Parenting practices discouraging PA were related to a greater number of socio-demographic and family/home characteristics than parenting practices encouraging PA. Parents with a young girl reported using parenting practices discouraging PA for safety reasons more often than parents with a boy, likely due to the former being more worried about their child's safety (De Vaus and Wise 1996). Women reported using parenting practices discouraging PA less frequently than men. Mothers may be more prepared to play with their children or exhibit a higher level of tolerance for their child's PA behavior. The same may apply to working parents, who may spend less time with their children than non-working parents and, hence, may be less likely to discourage their child's activities.

Parents of older preschoolers reported using practices related to behavioral control of PA more frequently and promoting inactivity less frequently than parents of younger preschoolers. The former association was observed in Latino parents (O'Connor et al. 2014b) and could be explained by older children being more capable of moving around and exploring their surroundings independently, which would lead to parents using controlling strategies. The items included in the subscale of promoting inactivity were mainly related to the provision of inactive transport, such as carrying a child in a stroller as an alternative to walking. These parenting practices may cease as the child gets older and becomes capable of walking independently (O'Connor et al. 2014b).

We also identified numerous family/home characteristics as correlates of parenting practices discouraging PA. For example, a positive association between size of home/unit/apartment and the promotion of inactivity was observed. Higher-income families may be able to afford more inactive modes of transport, including the use of strollers and personal cars to drive their child to places rather than relying on walking or public transport. Marital and household roles and satisfaction with these roles were also predictive of parenting practices discouraging PA. The number of childcare activities shared with others was negatively associated with promoting inactivity and screen time. Parents who receive support in daily childcare activities may not feel compelled to control and suppress their children's PA because they may have more discretionary time, or they may be assisted by others in controlling their children's behavior. Furthermore, our findings suggest that higher satisfaction with family life

may be associated with more opportunities of communication and good-quality interaction among family members which, in turn, may lead to less TV-viewing or passive family activities.

Household enjoyment of PA was negatively associated with parenting practices promoting screen time and positively associated with participatory engagement, modeling and structure. Parents who are more aware of the benefits of PA participation may also be aware of the adverse influence of too much screen activity time. In line with these findings, parental engagement of PA was predictive of lower levels of psychological/behavioral control. Parents may be more likely to let their children be physically active if they have a higher appreciation for PA.

Availability of passive-play equipment at home (including screen media) was positively associated with the promotion of screen time and practices related to safety concerns/overprotection. Parents who promote screen time are more likely to purchase screen-based entertainment equipment. Also, parents who are concerned about the safety of their neighborhood may acquire/install passive-play equipment at home to provide a range of activities for their children and, at the same time, keep them indoors.

Regarding the neighborhood environment, we found that community cohesion (an aspect of social capital) was negatively associated with the promotion of inactivity. Parents who perceive a higher level of community cohesion may allow their children to engage in more PA. Findings in other populations supports a link between social capital, higher levels of PA (Lindstrom et al. 2001) and lower levels of passive leisure time (Kim et al. 2006). Parents who reported more physical and social disorder and traffic hazards in their neighborhood were more likely to discourage their children from engaging in PA through the implementation of parenting practices related to safety concerns/overprotection, psychological/behavioral control of child's PA and/or the promotion of screen time. These types of practices can help parents limit their children's exposure to environmental and social threats in the neighborhood. In previous studies (O'Connor et al. 2014b), parents also reported using safety concerns/overprotection practices more often if they perceived higher levels of traffic hazards. However, in contrast to others (O'Connor et al. 2014b), we did not find significant associations between parenting practices that discourage child's PA, perceived stranger danger and PA-related informal social control. It is possible that Hong Kong parents believe that the threat from strangers is not sufficiently high to require restricting their children's PA.

This study has several limitations. The use of parenting practices discouraging PA may be under-reported as they may be regarded as undesired parenting styles. Data were collected on a stratified convenience sample, and most

participants in this study were mothers of preschoolers, which limits the generalizability of the results to fathers and other caregivers. Finally, causal relationships cannot be established due to the cross-sectional study design. Limitations notwithstanding, the stratification of the sample by area SES and population density enabled the inclusion of participants living in diverse neighborhood environments. In addition, we examined the contributions of a wide range of socio-demographic, family/home and neighborhood factors to the explanation of not only parenting practices encouraging child's PA but also practices discouraging child's PA, which was measured using a validated and culturally-specific instrument. Future studies need to expand this research agenda to parenting practices influencing preschoolers' overweight/obesity and related behaviors such as diet.

Conclusion for Practice

Adopting a socio-ecological framework, we examined socio-demographic, family/home and neighborhood correlates of PA-related parenting practices among parents of Chinese preschoolers in Hong Kong. Socio-demographic and family/home characteristics were correlates of both parenting practices encouraging and discouraging preschoolers' PA, while parent-perceived neighborhood environment factors were associated with parenting practices discouraging PA only. While some of the observed correlates were non-modifiable (e.g., socio-demographic factors), these findings may be helpful in identifying families who are at higher-risk of promoting an inactive lifestyle to their young children (e.g., low-educated families with young girls living in unsafe neighborhoods with low social cohesion). In line with a socio-ecological framework, this study suggests that future interventions aimed at increasing PA in Chinese young children via the promotion of PA-related parenting practices should be multi-level and target multiple factors. These include the promotion of PA and its benefits among parents, the promotion of harmonious relationships and childcare sharing among nuclear and extended family members, and environmental interventions aimed at enhancing traffic safety, safety from crime and community cohesion.

Acknowledgements This study was supported by grant # 201001159011—Seed Funding Program for Basic Research (The University of Hong Kong) awarded to Ester Cerin. Ester Cerin is supported by an Australian Research Council Future Fellowship (FT#140100085). The authors would like to thank all primary caregivers for their participation. We also thank the staff of all kindergartens and Maternal and Child Health Centers of the Department of Health of Hong Kong for their coordination and cooperation which made it possible to successfully complete this project.

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