Title: Community participation of school-age children: Who is at risk of restricted participation?

Running Title: Restrictions in children's community participation

Authors Names: Chi-Wen Chien[1], Chung-Ying Lin[1]

Authors' Affiliations:

[1] Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong (SAR), China.

Correspondence:

Dr. Chi-Wen Chien

Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong (SAR), China.

Tel: +852 2766 6703

Fax: +852 2330 8656

E-mail: will.chien@polyu.edu.hk

Acknowledgments: We thank the clinicians for their involvement in the online survey, and all of participating children, parents, and schools for their research participation.

Funding: This research was supported by The Hong Kong Polytechnic University (grant number 1-ZE4E).

Declaration of Interest Statement: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

ABSTRACT

Aims: This study aimed to identify children with restricted community participation and examine the extent to which the child, family, and environmental factors were associated with restricted participation. **Methods:** A school-based sample of 92 children with disabilities and 391 children without disabilities aged 5–12 years was recruited in Hong Kong. Parents completed the Participation and Environment Measure for Children and Youth and a demographic questionnaire. Moreover, children completed the Children's Depression Inventory. Rasch analysis was used to determine the criteria that differentiated between children with and without participation restriction, based on frequency of activities. Logistic regression was used to identify the factors associated with participation restriction. **Results:** One hundred seventy-three children (35.8% of the sample), including 42 with disabilities, were identified as having restricted participation. Participation restriction was associated with higher depressive symptoms in children (odds ratio (OR) = 1.05, 95% confidence interval (CI) [1.01, 1.08]), lower environmental resources (OR = 0.97, 95% CI [0.96, 0.99]), and coming from families with three or more children (OR = 2.80, 95% CI [1.44, 5.46]). **Conclusions:** The results suggest that a sizable number of children are at risk for restricted participation in the community. Healthcare services and strategies that address the associated factors are needed to promote children's community participation.

KEYWORDS: Children, Community Participation, Participation Restriction, Disability, Rasch Analysis.

Community is defined as “people who live within a geographically defined area and who have social and psychological ties with each other and with the place where they live” (Mattessich & Monsey, 2004, p. 56). Community participation refers to people’s participation in various types of activities in the community, and the frequency and type of social contacts they make during these activities (Clement & Bigby, 2018). The activities may include, but are not limited to, team sports or unstructured physical activity (PA), eating out at a local restaurant, hanging out, volunteering, and going to a museum (Bedell et al., 2011). Community participation offers the contexts in which children make friends, learn skills, and establish their sense of purpose (Hoogsteen & Woodgate, 2010; Law, 2002). It has been recognized as an important contributor to children’s health and quality of life (Berg et al., 2018; Rosato et al., 2008). Children entering school-age are reported to have decreased frequencies of engagement in community activities (Imms & Adair, 2017; Simpson et al., 2019). This is particularly relevant for elementary-aged children who are required to go to school for elementary education every school day, resulting in less time for participating in community activities. However, decreased community participation of school-aged children is multifactorial (King et al., 2009), and may not merely be attributed to the mandated time that children spend at school.

Among the factors that reportedly limit school-aged children’s opportunities to participate in their communities is the presence of a disability (Egilson et al., 2017; Milićević & Nedović, 2018). The effects of having a disability on participation is conceptualized in the International Classification of Functioning, Disability and Health (World Health Organization, 2001), where participation is influenced by one’s health condition and functional/environmental factors. Although the disability is real, its effects on participation are not inherent. Family and environmental support have recently been found to mediate or outweigh the influence of the disability on children’s interactions with their social

surroundings (Anaby et al., 2014; Di Marino et al., 2018; Law et al., 2007). Children with disabilities can participate in community activities after school, or during the weekend, if they receive adequate support (Adair et al., 2015). Conversely, school-aged children without a known disability may still be restricted in community participation if limited support or resources are available; therefore, they must be promptly identified to provide appropriate interventions and prevent negative health impacts. One way to identify children with restricted community participation is through the establishment of suitable indicators such as a cut-off value based on a common participation measure.

However, there are few indicators that have been adopted in research or practice to identify school-aged children with restricted community participation (Arakelyan et al., 2020; Belanger et al., 2009; Houtrow et al., 2012). The most common indicator is based on one type of activity or a combination of selected activities in which children never participate. For example, Houtrow and her colleagues (2012) determined three indicators for restricted community participation by separately focusing on children's non-participation in three organized activities (i.e., team sports, clubs, and organized events), paid work, and volunteering in the past 12 months. These indicators do not include a holistic range of community activities or provide a frequency level of these activities to indicate restricted participation. Therefore, little is known about factors associated with children who have restricted participation in comprehensive types of community activities based on the frequency of engagement. Furthermore, studies investigating factors of participation restriction thus far have focused predominantly on a specific diagnosis (Barr & Shields, 2011; Vogts et al., 2010) or multidiagnosis (King et al., 2009; Law et al., 2007), rather than generic samples encompassing children with and without disabilities (Anaby et al., 2014; Bedell et al., 2013). Considering that community participation involves children and people who live closely and are psychosocially tied, the inclusion of both children with and without

disabilities in one study is needed to identify factors that could be used for intervention planning or policy making for all children who live in the same community.

To address these knowledge gaps, the present study was guided by the findings of the broader literature on childhood participation to identify factors associated with community participation restriction among school-aged children with and without disabilities. The factors that have been examined include children's age, sex, and disability presence (Longo et al., 2013; Mc Manus et al., 2008; Ullenhag et al., 2014) as well as environmental support and resources (Anaby et al., 2014; Di Marino et al., 2018; Law et al., 2007). Previous studies also found that some family-related characteristics, such as socioeconomic status, family income, and the number of children in the family, had significant effects on children's community participation (Chien et al., 2017b; King et al., 2006; Palisano et al., 2011; Soref et al., 2012). Depression is a common mental health problem that causes children to feel sad or uninterested in things (e.g., engaging in activities); moreover, recent evidence suggests that participation in outdoor activities or PA may ameliorate depressive symptoms in children (Korczak et al., 2017). Thus, we were interested in examining this association, specifically in the context of community participation. In addition, we included three environmental factors (i.e., living space, whether someone smokes at home, and employment of a domestic helper at home) for exploratory purposes. These factors were relevant to local culture and might cause (e.g., small living space or smoking at home) or support (e.g., having a domestic helper) parents to take their child out for participation in community activities. Bronfenbrenner's ecological model (1979) was used to support the selection of the aforementioned variables and categorize them into three factors: (1) within the child (including sex, age, disability presence, and level of depressive symptoms); (2) in the family, which is considered the micro-system of the child (including family income, socioeconomic status, number of siblings of participating child, living space, smoking at home, and employing a domestic

helper); and (3) in the environment, which is considered the exo-system of the child (including levels of environmental support and resources).

The objectives of this study were to (1) identify school-aged children with and without disabilities who had restricted community participation using the frequency of engagement in a range of community activities as a criterion and (2) examine the extent to which the child, family, and environmental factors were associated with the restricted participation. Specifically, the research questions were: (1) What were the indicators for community participation restriction in school-aged children? (2) How many school-aged children were restricted in community participation? and (3) What factors influenced restricted community participation among school-aged children with and without disabilities?

MATERIALS AND METHODS

Participants

Data were drawn from a school-based sample that was collected in the Child Participation and Environment Study between March 2017 and April 2018. Sampling started by sending invitations to all schools throughout Hong Kong, and the first schools that accepted the invitation in each of the four major geographical regions (Hong Kong Island, Kowloon, New Territory East, and New Territory West) were included in the study. Additionally, two special schools for children with disabilities from the first and last regions accepted our invitations for research participation. In addition to attending one of the identified schools, inclusion criteria were that (1) the child age was between 5–12 years and (2) the child's parent could read Chinese. Children with sensory impairment (e.g., total blindness or hearing loss) or bodily impairment (e.g., amputation) were excluded, as they might exhibit diverse community participation patterns that were supported by assisting devices or adults' assistance. Ethical approval was obtained from the Human Subjects Ethics Sub-committee at

(*institution name omitted*) (reference number: *omitted*). Written consent was obtained from the parents.

Measures

Participation and Environment Measure for Children and Youth (PEM-CY)

The PEM-CY (Coster et al., 2011) was used to assess children's community participation through a parental report. This measure was chosen in this study because it captures community participation and environmental factors at the same time and can be completed by parents for children with and without disabilities. Moreover, the PEM-CY includes a range of 10 activities in the community setting. Engagement in each activity is measured using three scales: frequency (eight levels ranging from *never*=0 to *daily*=7), involvement (five levels ranging from *minimally*=1 to *very involved*=5), and desire for change (*no* or *yes*; if *yes*, parents can choose what type of changes are desired). In this study, the frequency scale was used to analyze and determine participation restriction, given that it is described as an objective, observable aspect of the participation construct (Imms et al., 2017). In addition, the number of parents' desired changes for more frequent engagement was used as a criterion to examine participation restriction. Summary scores were separately calculated for the frequency scale (using the average of all ratings except those to which parents responded *never*) and the desire for change scale (using the percentage of activities in which changes were desired by parents). The PEM-CY community participation section demonstrated fair-to-high internal consistency (0.55–0.85) and construct validity supported by known-group comparison and confirmatory factor analysis in children with and without disabilities (Chien et al., 2019; Coster et al., 2011).

In addition to community participation items, the PEM-CY has an environmental section that assesses environmental support and resources available for children's community participation. This section includes eight environmental support items (measured on a scale

ranging from 1 [*usually makes it harder*] to 3 [*usually helps*]) and seven environmental resources items (measured on a scale ranging from 1 [*usually no*] to 3 [*usually yes*]). Percent maximum possible scores can be generated by adding all of the item ratings, each of which have been divided by the number of items rated for environmental support and resources. Higher percent maximum possible scores indicate more environmental support and resources. These scales showed acceptable internal consistency (0.72–0.86), known-group validity, and factorial validity for children with and without disabilities (Chien et al., 2019; Coster et al., 2011).

Children's Depression Inventory (CDI)

The CDI (Chen, 2008) was used to assess children's depressive symptoms. It is a child-report questionnaire including 27 items. Each item is rated on a 0–2 scale (with 0 representing the absence of a depressive symptom and 2 representing the severe form of the symptom). The item scores are combined into a total score, which ranges from 0 to 54. Higher total scores indicate more clinically severe symptoms of depression. The internal consistency of the scale was 0.80 in this study.

Demographic Questionnaire

A demographic questionnaire was designed for the study to collect demographic information, including the child's sex, age, presence of a disability, number of siblings, family income, living space, employment of a domestic helper, and whether someone smokes at home. Parents also recorded their educational level and occupation, which were used to assess their socioeconomic status (Hollingshead, 1975).

Data Analysis

Analysis Approach for Determining the Criterion that Identifies Children with Participation Restriction

To identify the criterion that differentiated between children with and without participation

restriction based on the frequency of their engagement in community activities, Rasch analysis staging approach (Jette et al., 2008) was used. This approach enabled the calibration of a range of activities along a unidimensional, progressive hierarchy from the lowest to the highest frequency of participation. We were then able to explore a criterion to identify the cut-off for distinct levels of participation along this hierarchical continuum of the frequency of activities.

Following Rasch analysis staging approach, we first applied Rasch analysis to examine the rating scale performance of the eight frequency levels and the unidimensionality of the 10 community items of the PEM-CY, similar to the procedures used in the validation of other children's participation measures (Bedell, 2009; Chiarello et al., 2014; Chien et al., 2015). Regarding the rating scale performance, we found that the original eight-level frequency scale did not meet Rasch rating scale assumptions (see Table 1). The eight frequency categories were thus reorganized as a five-level scale to optimize the appropriateness of the rating scale. The rescaling was implemented by collapsing three frequency options, namely "a few times a month," "once a month," and "a few times in the last four months" into the single option "three times or less in the last one month," and combining "once in the last four months" with "never." The new scale functioned satisfactorily under Rasch model's expectation.

Regarding the unidimensionality of the 10 community items, we found that one item (working for pay) demonstrated a sign of misfit in Rasch analysis (Table 2), indicating its departure from the unidimensional construct represented by the other items. This item was thus removed, and after re-running Rasch analysis, no further misfit items were found. More than half (54%) of the total variance was accounted for by the Rasch-derived construct, and no sizable secondary components (eigenvalue size=1.16–1.51) existed, which was indicative of unidimensionality. These well-fitting items were finally calibrated into a continuum from

"easy" to "difficult" in a keyform (Figure 1), with all the participation items on the right side and the numbers corresponding to the revised five-level frequency scale of each item placed on the opposite side.

Next, we based the keyform to select one participation item at a specific frequency level (i.e., engaging in unstructured PA in the community three times or less in the last one month) as the criterion for children's community participation restriction. This item was selected because it demonstrated a middle-difficulty level in the hierarchical continuum (see the right side of Figure 1). The five-level frequency scale of this item was also adequately targeted to the range of children's participation in the current sample; that is, its mid-level category of two is close to the median of the children's scores on the Figure 1. Additionally, we found that this participation item was the activity in which most parents (50.1%) in the present study wanted their children to engage more often in the types of desired change of the PEM-CY (Appendix 1).

Lastly, we followed Jette et al.'s (2008) suggestion to invite clinical experts to help us determine the criterion. An online survey was designed and sent to 15 pediatric-related clinicians (including one pediatrician, one social worker, two physical therapists, two educational psychologists, two speech therapists, and seven occupational therapists) within the researchers' network. From the list of the 10 community activities in the PEM-CY, these clinicians were asked to choose three community activities that were important for elementary school children to participate in. The choices were limited to three by the researchers because of the primary focus on the most important activities. Information about the keyform and our a priori selected criterion for participation restriction was then shown in the survey. These clinicians were asked to indicate their agreement with this criterion or provide comments. From the clinicians' input (Appendix 2), unstructured PA was chosen most frequently (67%) as one of the important community activities before they were

informed of our a priori selected criterion. Ten of the 15 clinicians further indicated their support for using the frequency level "three times or less in the last one month" for this activity as the criterion.

Taken together, engaging in unstructured PA in the community three times or less in the last one month was determined as the criterion identifying children with community participation restriction. By calculating the Rasch threshold value corresponding to this criterion, we derived a cut-off value (standard error) of 31.60 (2.87) points from the Rasch-transformed score (range 0–100), which is presented as the red dotted line shown in Figure 1. This value was used to identify children who had restricted community participation.

Analysis Approach for Validating the Determined Criterion and Identifying Factors Associated with Participation Restriction

Independent-sample *t* tests were used to examine whether the cut-off value of the determined criterion was able to distinguish the participation frequency and the parents' desired change for greater frequency between children with and without participation restriction.

Multivariate logistic regression analysis was used to investigate factors associated with participation restriction. Strength of the association was reported by odds ratio (OR) and 95% confidence interval (CI). In this multivariate logistic regression analysis, group membership of participation restriction (0=no, 1=yes) was the dependent variable. The independent variables were the following predictor variables: sex (0=boy, 1=girl), age (range, 5.00–12.99), disability presence (0=no, 1=yes), depressive symptoms (range, 0–54), socioeconomic status (range, 8–66), family income (0=above or equal to median, 1=below median), number of siblings (0=none, 1=1 sibling, 2=≥2 siblings), living space (0=<400 ft^2, 1=401–800 ft^2, 2=≥801 ft^2), employment of a domestic helper (0=yes, 1=no), whether someone smokes at home (0=no, 1=yes), and environmental support (range, 0–100) and resources (range, 0–100).

Multiple imputation was used to deal with missing data in those predictor variables. Statistical Package for the Social Sciences Version 20.0 (SPSS Inc., Chicago, USA) was used for all analyses. The level of significance was set at p <0.05 for all analyses.

RESULTS

A total of 2,348 parents of eligible children were approached from the six schools, and 535 consented to participate in the study and completed the questionnaire about their children. There were 104 children who were sibling pairs from the same family and thus had a co-participation tendency; therefore, we excluded data from one child randomly from each family. The final sample included 483 parent-child dyads (see Table 3 for the sample characteristics). Most respondents were mothers (75.2%) and had a monthly family income higher than the median (66.9%). Among the children, more than half (56.5%) were male and the mean age was 8.8 years. As reported by the parents, 92 (19.0%) children had one or more clinical diagnoses/disabilities including attention deficit hyperactivity disorder (29; 6.0%), dyslexia (24; 5.0%), developmental delay (21; 4.3%), autism spectrum disorder (19; 3.9%), intellectual disability (7; 1.4%), and traumatic brain injury (2; 0.4%).

Using the determined criterion and its cut-off value of Rasch-transformed scores, 173 (35.8%) of the 483 children were identified as having participation restriction. Compared with children without participation restriction, those with participation restriction participated in community activities significantly less often (t=21.3, p<0.001) in terms of total participation frequency scores. Their parents also desired significantly more changes in their child's participation frequency (t=2.4, p=0.017), indicating discriminant validity of the determined criterion and cut-off values.

Logistic regression results are presented in Table 4. A higher likelihood of community participation restriction for children was associated with higher depressive symptoms

(OR=1.05, 95% CI [1.01, 1.08]), families that had three or more children compared with those with only one child (OR 2.81, 95% CI [1.44, 5.46]), and lower environmental resources (OR 0.97, 95% CI [0.96, 0.99]). The results indicate that there is a 5% (and 181%) increase in the odds of community participation restriction if a child has higher depressive symptoms (and has two or more siblings), compared to those with lower symptoms (and with no siblings). Conversely, the odds of community participation restriction are reduced by 3% if a child has more environmental resources, compared to those with fewer resources.

DISCUSSION

This study identified the factors associated with participation restriction that was determined based on the frequency of participation in a comprehensive range of community activities in a combined sample of school-aged children with and without disabilities. With the determined criterion and cut-off value, we found that more than one-third of the children had community participation restriction. Moreover, we found that behavioral/intellectual disability (in the context of this study) might not be a factor associated with children's participation restriction. Instead, children who had higher levels of depression, came from families with three or more children, and had lower levels of environmental resources were at risk of participation restriction.

Rasch analysis staging approach, since it was proposed to classify functional stages (Jette et al., 2008), has been used to establish other classification systems for upper-extremity impairment (Woodbury et al., 2013) and chronic pain (Chien et al., 2017a). The present study extended its application to defining community participation restriction among school-aged children. Community participation has been found to be a mediator between the environment and children's mental health (Nordbø et al., 2020) as well as between their functional abilities and quality of life (Williams et al., 2020). Therefore, it is important to have a criterion that

identifies those children with restricted community participation in a timely manner to prevent the impact on their health and quality of life. In this study, although engaging in unstructured PA in the community was targeted as the cut-off criterion, the study results illustrated in Figure 1 provide a spectrum of participation patterns that can be expected of children within a restriction category. For example, children with participation restriction may engage in unstructured PA three times or less in the last month, and once or never engage in overnight visits, religious activities, community events, and club-related activities during the past four months. However, these children may still engage in some community activities mostly once a week, such as neighborhood outing activities, community-based classes, organized PA, and getting together with other children in the community. This set of the criteria for participation restriction may assist clinicians in understanding the kinds and frequencies of community activities a child does not accomplish, in order to provide suitable intervention and service to promote their community participation.

It is noted that the participation measure used in this study does not ask parents to report their children's participation duration (i.e., the period of time during which participation in an activity continues) or the importance of each type of community activities. The development of the PEM-CY was informed by parents' perspectives of participation, where they described that their child participated more in activities in terms of the frequency (Bedell et al., 2011). This supports that attendance (including frequency) has been conceptualized as one of the two important dimensions of participation in the framework of the family of participation-related constructs proposed by Imms et al. (2017). However, it is possible that a child may not participate often in community activities but spend many hours engaging in the activity each time they participate, or they may participate daily in only one activity that is important to the child. On the other hand, a child may participate often in many community activities, but the duration of participation in each activity is short or the activities are not

important to the child. In these situations, identification of children with restricted community participation using the set of the spectrum of participation patterns based on frequency of activities may be misleading. To avoid this, future studies that consider the duration and perceived importance of participation in community activities to conceptualize participation restriction are warranted.

In this study, the role of the 15 clinicians was to assist in our decision-making about the criteria for participation restriction. We found two clinicians who disagreed with our proposed criteria, and one of them argued that children should engage in unstructured PA daily in the community. Although PA participation is essential to children's health (Janssen & Leblanc, 2010), it seems that clinical experts may have high expectations regarding PA participation frequency, possibly because of their professional training in promoting children's participation and physical health. In fact, the children in this study did not participate in community activities sufficiently, especially in unstructured PA (i.e., 30.3% of children engaged once per week) compared with organized PA (i.e., 54.9% engaged once per week). This is consistent with previous findings that children spent less time participating in unstructured PA (Gallant et al., 2017) but consistently participated in organized PA as they aged (Belanger et al., 2009). Many reasons (e.g., being in school or specializing in one sport) may explain the comparatively low frequency of unstructured PA in school-aged children, and an extensive discussion would exceed the scope of this study. Taken together with previous findings, it seems realistic to target unstructured PA with a lower frequency level as the criterion distinguishing the elementary-aged children with and without participation restriction in this study. However, development of different participation restriction criteria for children at different ages may be needed in future studies, as participation in unstructured PA declines, especially during adolescence (Gallant et al., 2017; Wall et al., 2011).

Consistent with recent studies (Anaby et al., 2014; Di Marino et al., 2018), our findings indicated that the number of siblings and level of environmental resources, rather than the presence of disabilities, were significant factors of participation restriction across all children included in this study. These findings are not unexpected because most children with disabilities in this study had behavioral or intellectual disabilities rather than physical disabilities. Therefore, those children may have independent mobility, which allows them to move around for community participation. Contrarily, logistical concerns may affect the parents' mindset toward their children's participation in the community. In particular, parents who have three children (including a child with disabilities) will need to make greater efforts when catering to all children to engage in community events, PA, or overnight trips. Some parents may also be confronted with insufficient resources (e.g., time, transportation, and information) to support their children's engagement in community activities, which in turn may lead to reduced frequency. On the other hand, we noticed that participation restriction in children was not associated with lower socioeconomic status and income of the families as well as no employment of a domestic helper in the current study. This implies that financial disadvantage and a lack of additional human support might not hinder parents from taking their children out to participate in community activities. It is speculated that the parents of this sample, specifically those who have three children or insufficient resources, may not have suitable coping strategies that they could use to support participation. Studies have begun exploring parents' strategies that promote community participation in children with disabilities (Schiavone et al., 2018) or who receive early intervention services (Khetani et al., 2013). Strategies such as advanced planning, getting information about community activities, and parental participation were reported to encourage children's community participation and help reduce parental stress surrounding their child's participation. These strategies may be useful for parents of children who are at risk of participation restriction to increase their

child's participation in community activities and could be trialed in a future study.

The present study found that children's participation restriction was significantly associated with higher depressive symptoms. This finding is in line with the conceptualization of participation, where emotion is one of contributing factors of children's participation (Hoogsteen & Woodgate, 2010; Imms et al., 2017; King et al., 2003). Recent meta-analysis and studies also provided evidence supporting the link between depression and activity participation (Berg et al., 2018; Korczak et al., 2017). However, little is known regarding the mechanism underlying the relationship between depression and activity participation. King et al. (2003) postulated that feeling unhappy could make involvement in activities difficult for a child, such as being less proactive, interactive, and connected with others. This circumstance could be even worse when taking part in community activities that are highly social for school-aged children who are developing interpersonal skills. Children who are more depressed are less likely to get pleasant feelings from their limited involvement and interaction with people in community activities; consequently, the frequency of subsequent participation would be reduced. While the mediating role of participation involvement on the relationship between child depression and activity frequency remains at the conceptual level, future studies are needed to identify strategies that support community participation of children with higher depressive symptoms.

Study Limitations

This study had three limitations. First, a school-based sample of children with and without behavioral/intellectual disabilities was recruited in Hong Kong. The results cannot be generalized to children with specific diagnoses/disabilities in clinical samples or children in other countries. Second, we relied on parental reports of children's participation, limiting our ability to identify participation restriction from children's perspectives. Moreover, clinicians (rather than parents or children) were involved in this study to specify the most important

activities when determining the criterion for participation restriction. Considering that clinicians' views on important activities could be different from parents' or children's views, this may threaten the validity of the established criterion. Future studies that utilize child-report participation measures and include parents' perception on important community activities are needed to verify the results of the current study. Lastly, the participant recruitment of this study was conducted over one year. Therefore, the children's community participation patterns could be varied across different seasons, making it difficult to generalize the study findings to specific timing for interpretation.

Implication for Practice

The findings of this study can assist physical or occupational therapists in identifying children who have restricted community participation through the use of the keyform. This keyform provides a simple tool that can record the frequency of children's participation and determine whether it falls into the restriction category. Therapists are also recommended to consider information about the child's emotional status, number of siblings that they have, and environmental resources supporting their community participation, in order to develop strategies that promote children's participation in community activities.

CONCLUSION

More than one-third of school-aged children, regardless of whether they had a behavioral or intellectual disability, were found as having restricted participation based on the frequency of community activities. These children had higher levels of depression, came from families with more than two children, and had fewer environmental resources. Child-focused professionals need to advocate for the development of interventions, services, and strategies to promote these children's community participation.

References

Adair, B., Ullenhag, A., Keen, D., Granlund, M., & Imms, C. (2015). The effect of interventions aimed at improving participation outcomes for children with disabilities: A systematic review. *Developmental Medicine and Child Neurology, 57*(12), 1093-1104. https://doi.org/10.1111/dmcn.12809

Anaby, D., Law, M., Coster, W., Bedell, G., Khetani, M., Avery, L., & Teplicky, R. (2014). The mediating role of the environment in explaining participation of children and youth with and without disabilities across home, school, and community. *Archives of Physical Medicine and Rehabilitation, 95*(5), 908-917. https://doi.org/10.1016/j.apmr.2014.01.005

Arakelyan, S., Maciver, D., Rush, R., O'Hare, A., & Forsyth, K. (2020). Community-based participation of children with and without disabilities. *Developmental Medicine and Child Neurology, 62*(4), 445-453. https://doi.org/10.1111/dmcn.14402

Barr, M., & Shields, N. (2011). Identifying the barriers and facilitators to participation in physical activity for children with Down syndrome. *Journal of Intellectual Disability Research, 55*(11), 1020-1033. https://doi.org/10.1111/j.1365-2788.2011.01425.x

Bedell, G. (2009). Further validation of the Child and Adolescent Scale of Participation (CASP). *Developmental Neurorehabilitation, 12*(5), 342-351. https://doi.org/10.3109/17518420903087277

Bedell, G., Coster, W., Law, M., Liljenquist, K., Kao, Y. C., Teplicky, R., Anaby, D., & Khetani, M. A. (2013). Community participation, supports, and barriers of school-age children with and without disabilities. *Archives of Physical Medicine and Rehabilitation, 94*(2), 315-323. https://doi.org/10.1016/j.apmr.2012.09.024

Bedell, G. M., Khetani, M. A., Cousins, M. A., Coster, W. J., & Law, M. C. (2011). Parent perspectives to inform development of measures of children's participation and environment. *Archives of Physical Medicine and Rehabilitation, 92*(5), 765-773.

https://doi.org/10.1016/j.apmr.2010.12.029

Belanger, M., Gray-Donald, K., O'Loughlin, J., Paradis, G., Hutcheon, J., Maximova, K., & Hanley, J. (2009). Participation in organised sports does not slow declines in physical activity during adolescence. *International Journal of Behavioral Nutrition and Physical Activity, 6*), 22. https://doi.org/10.1186/1479-5868-6-22

Berg, K. L., Medrano, J., Acharya, K., Lynch, A., & Msall, M. E. (2018). Health impact of participation for vulnerable youth with disabilities. *American Journal of Occupational Therapy, 72*(5), 7205195040p7205195041-7205195040p7205195049. https://doi.org/10.5014/ajot.2018.023622

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Harvard University Press.

Chen, S. U. (2008). *Children's depression inventory - Taiwanese version*. Psychological Publishing.

Chiarello, L. A., Palisano, R. J., McCoy, S. W., Bartlett, D. J., Wood, A., Chang, H. J., Kang, L. J., & Avery, L. (2014). Child Engagement in Daily Life: A measure of participation for young children with cerebral palsy. *Disability and Rehabilitation, 36*(21), 1804-1816. https://doi.org/10.3109/09638288.2014.882417

Chien, C. W., Bagraith, K. S., Khan, A., Deen, M., Syu, J. J., & Strong, J. (2017a). Establishment of cutpoints to categorize the severity of chronic pain using composite ratings with Rasch analysis. *European Journal of Pain, 21*(1), 82-91. https://doi.org/10.1002/ejp.906

Chien, C. W., Li-Tsang, C. W. P., Cheung, P. P. P., Leung, K. Y., & Lin, C. Y. (2019). Development and psychometric evaluation of the Chinese version of the Participation and Environment Measure for Children and Youth. *Disability and Rehabilitation*. https://doi.org/10.1080/09638288.2018.1553210

Chien, C. W., Rodger, S., & Copley, J. (2015). Development and psychometric evaluation of

a new measure for children's participation in hand-use life situations. *Archives of Physical Medicine and Rehabilitation, 96*(6), 1045-1055. https://doi.org/10.1016/j.apmr.2014.11.013

Chien, C. W., Rodger, S., & Copley, J. (2017b). Parent-reported participation in children with moderate-to-severe developmental disabilities: Preliminary analysis of associated factors using the ICF framework. *International Journal of Disability, Development and Education, 64*(5), 483-496. https://doi.org/10.1080/1034912X.2017.1290221

Clement, T., & Bigby, C. (2018). Breaking out of a distinct social space: Reflections on supporting community participation for people with severe and profound intellectual disability. *Journal of Applied Research in Intellectual Disabilities, 22*(3), 264-275. https://doi.org/10.1111/j.1468-3148.2008.00458.x

Coster, W., Bedell, G., Law, M., Khetani, M. A., Teplicky, R., Liljenquist, K., Gleason, K., & Kao, Y. C. (2011). Psychometric evaluation of the Participation and Environment Measure for Children and Youth. *Developmental Medicine and Child Neurology, 53*(11), 1030-1037. https://doi.org/10.1111/j.1469-8749.2011.04094.x

Di Marino, E., Tremblay, S., Khetani, M., & Anaby, D. (2018). The effect of child, family and environmental factors on the participation of young children with disabilities. *Disability and Health Journal, 11*(1), 36-42. https://doi.org/10.1016/j.dhjo.2017.05.005

Egilson, S. T., Jakobsdottir, G., Olafsson, K., & Leosdottir, T. (2017). Community participation and environment of children with and without autism spectrum disorder: Parent perspectives. *Scandinavian Journal of Occupational Therapy, 24*(3), 187-196. https://doi.org/10.1080/11038128.2016.1198419

Gallant, F., O'Loughlin, J. L., Brunet, J., Sabiston, C. M., & Belanger, M. (2017). Childhood sports participation and adolescent sport profile. *Pediatrics, 140*(6), Article 20171449. https://doi.org/10.1542/peds.2017-1449

Hollingshead, A. B. (1975). *Four factor index of social status*. [Unpublished manuscript]. Department of Sociology, Yale University.

Hoogsteen, L., & Woodgate, R. L. (2010). Can I play? A concept analysis of participation in children with disabilities. *Physical and Occupational Therapy in Pediatrics, 30*(4), 325-339. https://doi.org/10.3109/01942638.2010.481661

Houtrow, A., Jones, J., Ghandour, R., Strickland, B., & Newacheck, P. (2012). Participation of children with special health care needs in school and the community. *Academic Pediatrics, 12*(4), 326-334. https://doi.org/10.1016/j.acap.2012.03.004

Imms, C., & Adair, B. (2017). Participation trajectories: Impact of school transitions on children and adolescents with cerebral palsy. *Developmental Medicine and Child Neurology, 59*(2), 174-182. https://doi.org/10.1111/dmcn.13229

Imms, C., Granlund, M., Wilson, P. H., Steenbergen, B., Rosenbaum, P. L., & Gordon, A. M. (2017). Participation, both a means and an end: A conceptual analysis of processes and outcomes in childhood disability. *Developmental Medicine and Child Neurology, 59*(1), 16-25. https://doi.org/10.1111/dmcn.13237

Janssen, I., & Leblanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity, 7*, Article 40. https://doi.org/10.1186/1479-5868-7-40

Jette, A. M., Norweg, A., & Haley, S. M. (2008). Achieving meaningful measurements of ICF concepts. *Disability and Rehabilitation, 30*(12-13), 963-969. https://doi.org/10.1080/09638280701800426

Khetani, M., Cohn, E. S., Orsmond, G. I., Law, M. C., & Coster, W. J. (2013). Parent perspectives of participation in home and community activities when receiving Part C early intervention services. *Topics in Early Childhood Special Education, 32*(4), 234-245. https://doi.org/10.1177/0271121411418004

King, G., Law, M., Kertoy, M., & Petrenchik, T. (2006). Predictors of the leisure and recreation participation of children with physical disabilities: A structural equation modeling analysis. *Children's Health Care, 35*(3), 209-234. https://doi.org/10.1080/J006v23n01_05

King, G., Law, M., King, S., Rosenbaum, P., Kertoy, M. K., & Young, N. L. (2003). A conceptual model of the factors affecting the recreation and leisure participation of children with disabilities. *Physical and Occupational Therapy in Pediatrics, 23*(1), 63-90. https://doi.org/10.1080/J006v23n01_05

King, G., McDougall, J., Dewit, D., Petrenchik, T., Hurley, P., & Law, M. (2009). Predictors of change over time in the activity participation of children and youth with physical disabilities. *Children's Health Care, 38*(4), 321-351. https://doi.org/10.1207/s15326888chc3503_2

Korczak, D. J., Madigan, S., & Colasanto, M. (2017). Children's physical activity and depression: A meta-analysis. *Pediatrics, 139*(4), Article 20162266. https://doi.org/10.1542/peds.2016-2266

Law, M. (2002). Participation in the occupations of everyday life. *American Journal of Occupational Therapy, 56*(6), 640-649. https://doi.org/10.5014/ajot.56.6.640

Law, M., Petrenchik, T., King, G., & Hurley, P. (2007). Perceived environmental barriers to recreational, community, and school participation for children and youth with physical disabilities. *Archives of Physical Medicine and Rehabilitation, 88*(12), 1636-1642. https://doi.org/10.1016/j.apmr.2007.07.035

Longo, E., Badia, M., & Orgaz, B. M. (2013). Patterns and predictors of participation in leisure activities outside of school in children and adolescents with cerebral palsy. *Research in Developmental Disabilities, 34*(1), 266-275. https://doi.org/10.1016/j.ridd.2012.08.017

Mattessich, P., & Monsey, M. (2004). *Community building: What makes it work*. Wilder

Foundation.

Mc Manus, V., Corcoran, P., & Perry, I. J. (2008). Participation in everyday activities and quality of life in pre-teenage children living with cerebral palsy in South West Ireland. *BMC Pediatrics, 8,* Article 50. https://doi.org/10.1186/1471-2431-8-50

Milićević, M., & Nedović, G. (2018). Comparative study of home and community participation among children with and without cerebral palsy. *Research in Developmental Disabilities, 80,* 74-83. https://doi.org/10.1016/j.ridd.2018.06.010

Nordbø, E. C. A., Raanaas, R. K., Nordh, H., & Aamodt, G. (2020). Disentangling how the built environment relates to children's well-being: Participation in leisure activities as a mediating pathway among 8-year-olds based on the Norwegian Mother and Child Cohort Study. *Health and Place, 64,* Article 102360. https://doi.org/10.1016/j.healthplace.2020.102360

Palisano, R. J., Chiarello, L. A., Orlin, M., Oeffinger, D., Polansky, M., Maggs, J., Bagley, A., & Gorton, G. (2011). Determinants of intensity of participation in leisure and recreational activities by children with cerebral palsy. *Developmental Medicine and Child Neurology, 53*(2), 142-149. https://doi.org/10.1111/j.1469-8749.2010.03819.x

Rosato, M., Laverack, G., Grabman, L. H., Tripathy, P., Nair, N., Mwansambo, C., Azad, K., Morrison, J., Bhutta, Z., Perry, H., Rifkin, S., & Costello, A. (2008). Community participation: Lessons for maternal, newborn, and child health. *Lancet, 372*(9642), 962-971. https://doi.org/10.1016/S0140-6736(08)61406-3

Schiavone, N., Szczepanik, D., Koutras, J., Pfeiffer, B., & Slugg, L. (2018). Caregiver strategies to enhance participation in children with autism spectrum disorder. *OTJR: Occupation, Participation and Health, 38*(4), 235-244. https://doi.org/10.1177/1539449218786713

Simpson, K., Adams, D., Bruck, S., & Keen, D. (2019). Investigating the participation of children on the autism spectrum across home, school, and community: A longitudinal

study. *Child: Care, Health and Development, 45*(5), 681-687. https://doi.org/10.1111/cch.12679

Soref, B., Ratzon, N. Z., Rosenberg, L., Leitner, Y., Jarus, T., & Bart, O. (2012). Personal and environmental pathways to participation in young children with and without mild motor disabilities. *Child: Care, Health and Development, 38*(4), 561-571. https://doi.org/10.1111/j.1365-2214.2011.01295.x

Ullenhag, A., Krumlinde-Sundholm, L., Granlund, M., & Almqvist, L. (2014). Differences in patterns of participation in leisure activities in Swedish children with and without disabilities. *Disability and Rehabilitation, 36*(6), 464-471. https://doi.org/10.3109/09638288.2013.798360

Vogts, N., Mackey, A. H., Ameratunga, S., & Stott, N. S. (2010). Parent-perceived barriers to participation in children and adolescents with cerebral palsy. *Journal of Paediatrics and Child Health, 46*(11), 680-685. https://doi.org/10.1111/j.1440-1754.2010.01815.x

Wall, M. I., Carlson, S. A., Stein, A. D., Lee, S. M., & Fulton, J. E. (2011). Trends by age in youth physical activity: Youth Media Campaign Longitudinal Survey. *Medicine and Science in Sports and Exercise, 43*(11), 2140-2147. https://doi.org/10.1249/MSS.0b013e31821f561a

Williams, K., Jacoby, P., Whitehouse, A., Kim, R., Epstein, A., Murphy, N., Reid, S., Leonard, H., Reddihough, D., & Downs, J. (2020). Functioning, participation, and quality of life in children with intellectual disability: An observational study. *Developmental Medicine and Child Neurology*. Advance online publication. https://doi.org/10.1111/dmcn.14657

Woodbury, M. L., Velozo, C. A., Richards, L. G., & Duncan, P. W. (2013). Rasch analysis staging methodology to classify upper extremity movement impairment after stroke. *Archives of Physical Medicine and Rehabilitation, 94*(8), 1527-1533. https://doi.org/10.1016/j.apmr.2013.03.007

World Health Organization. (2001). *International classification of functioning, disability, and health*. World Health Organization.

TABLE 1. Summary of Rasch Rating Scale Function of Community Participation Items

	Observed count*	Observed average*	Intfit MnSq*	Outfit MnSq*	Step threshold*
Original form					
0: Never	1525	-1.42	1.01	0.99	–
1: Once in the last 4 months	565	-1.00	0.78	0.61	-0.20
2: A few times in the last 4 months	486	-0.72	0.97	0.79	-0.72
3: Once a month	226	-0.50	0.85	0.80	0.13
4: A few times a month	399	-0.23	0.87	1.05	-0.99
5: Once a week	816	-0.15	1.23	1.43	-0.92
6: A few times a week	563	0.24	0.86	1.05	0.42
7: Daily	83	0.35	1.57	4.81	2.28
Rescaled form					
0: Once or never in the last 4 months†	2090	-2.81	0.90	0.93	–
1: Three times or less in the last 1 month‡	1111	-1.44	0.98	0.80	-1.50
2: Once a week	816	-0.72	1.07	1.10	-0.78
3: A few times a week	563	0.04	0.94	1.05	0.03
4: Daily	83	0.28	1.49	3.90	2.25

* Rating scale functions were identified as problematic if the following criteria were not met: (a) >10 observations per rating category; (b) monotonically increasing average measures across rating categories; (c) both infit and outfit mean square values less than 2.0; and (d) monotonically increasing step thresholds that represented the increments in difficulty as the rating categories progress from a rating of 0 to a rating of 1, from 1 to 2, from 2 to 3, etc.

† This rating category was generated by combining “once in the last 4 months” with “never”.

‡ This rating category was generated by collapsing three frequency options, namely “a few times a month,” “once a month,” and “a few times in the last 4 months” into a single option.

Abbreviation: MnSq, mean square.

TABLE 2. Rasch-based Measures and Fit Statistics of Community Participation Items

Items[†]	Measure	SE	Infit MnSq	Infit Zstd	Outfit MnSq	Outfit Zstd
Working for pay[‡]	2.41	0.15	2.77	7.3	2.22	4.4
Overnight visits or trips	1.50	0.10	0.89	-1.0	0.98	-0.1
Religious or spiritual gatherings and activities	0.63	0.07	1.34	3.8	1.34	3.2
Community events	0.59	0.07	0.64	-5.1	0.68	-3.7
Organizations, groups, clubs, and volunteer or leadership activities	0.57	0.07	1.28	3.3	1.34	3.3
Unstructured physical activities	-0.69	0.05	0.75	-4.7	0.76	-4.4
Getting together with other children in the community	-0.84	0.05	0.82	-3.4	0.81	-3.4
Organized physical activities	-1.02	0.05	1.08	1.4	1.07	1.2
Classes and lessons (not school-sponsored)	-1.04	0.05	1.13	2.2	1.11	1.8
Neighborhood outings	-2.11	0.06	0.86	-2.2	0.89	-1.8

[†] The items are placed in a hierarchical order by their difficulty measures.

[‡] This item was identified to exhibit misfit (i.e., infit and outfit MnSq > 1.4, and infit and outfit Zstd > 2.0).

Abbreviations: SE, standard error; MnSq, mean square; Zstd.

TABLE 3. Sample Characteristics

Characteristics*	Study sample		
	Disability (n=92)	Non-disability (n=391)	Total (n=483)
Respondent, n (%)			
Mother	14 (15.3)	289 (73.9)	363 (75.2)
Father	74 (80.4)	91 (23.3)	105 (21.7)
Guardian/Caregiver	4 (4.3)	11 (2.9)	15 (3.1)
Mother's age, mean (SD), years	39.6 (5.2)	39.6 (5.0)	39.6 (5.0)
Father's age, mean (SD), years	42.9 (6.1)	44.0 (6.7)	43.8 (6.6)
Family socioeconomic status,† mean (SD)	36.6 (13.8)	37.7 (13.4)	37.5 (13.5)
Family monthly income,‡ n (%)			
Below median	40 (43.5)	118 (30.2)	158 (32.7)
Equal to or above median	52 (56.5)	271 (69.3)	323 (66.9)
Employing a domestic helper, n (%)			
No	73 (79.3)	286 (73.1)	359 (74.4)
Yes	19 (20.7)	99 (25.3)	118 (24.4)
Living space, n (%)			
<400 ft^2	44 (47.8)	142 (36.3)	186 (38.5)
401–800 ft^2	38 (41.3)	199 (50.9)	237 (49.1)
>801 ft^2	10 (10.9)	48 (12.3)	58 (12.0)
Whether someone smokes at home, n (%)			
No	64 (69.6)	276 (70.6)	340 (70.4)
Yes	28 (30.4)	113 (28.9)	141 (29.2)
Living district, n (%)			
Hong Kong Island	19 (20.7)	123 (31.5)	142 (29.4)
Kowloon	26 (28.3)	88 (22.5)	114 (23.6)
New Territory West	29 (31.5)	60 (15.3)	89 (18.4)
New Territory East	17 (18.5)	109 (27.9)	126 (26.1)
Other districts	1 (1.1)	10 (2.6)	11 (2.3)
Child sex, n (%)			
Male	68 (73.9)	205 (52.4)	273 (56.5)
Female	24 (26.1)	186 (47.6)	210 (43.5)
Child age, mean (SD), years	8.6 (1.8)	8.9 (1.8)	8.8 (1.8)
Number of siblings, n (%)			
0	22 (23.9)	106 (27.1)	128 (26.5)
1	53 (57.6)	219 (56.0)	272 (56.3)
≥2	12 (13.1)	52 (13.3)	64 (13.3)

* There were between 1 and 19 missing values in some demographic characteristics.

† Socioeconomic status was calculated using Hollingshead's 4-factor index.

‡ The median of family monthly income was $20,500 Hong Kong dollars, based on 2011 Population Census, and was used to dichotomize the variable in this study.

Abbreviation: SD, standard deviation.

TABLE 4. Multivariate Logistic Regression Model of Children's Community Participation

	Model	
Factors*	Odds ratio [95% CIs]	*p* value
Child factors		
Sex (Reference: Boy)	1.30 [0.86, 1.98]	0.215
Age	1.10 [0.98, 1.23]	0.108
Presence of disability (Reference: No)	1.44 [0.86, 2.42]	0.168
Level of depressive symptoms	1.05 [1.01, 1.08]	0.011
Family factors		
Socioeconomic status	0.99 [0.97, 1.01]	0.176
Family income (Reference: ≥median)	1.20 [0.73, 1.98]	0.475
Number of siblings (Reference: None)		
vs. 1 sibling	1.38 [0.84, 2.26]	0.204
vs. ≥2 siblings	2.80 [1.44, 5.46]	0.002
Living space (Reference: <400 ft^2)		
vs. 401–800 ft^2	1.54 [0.94, 2.50]	0.084
vs. ≥800 ft^2	1.17 [0.54, 2.50]	0.693
Employing domestic helper (Reference: Yes)	1.48 [0.86, 2.57]	0.160
Smoking at home (Reference: No)	1.41 [0.90, 2.20]	0.133
Environmental factors		
Level of environmental support	0.99 [0.97, 1.01]	0.471
Level of environmental resources	0.97 [0.96, 0.99]	0.002

* Categorical variables are presented with the reference category in parenthesis.

Abbreviation: CIs, confidence intervals.

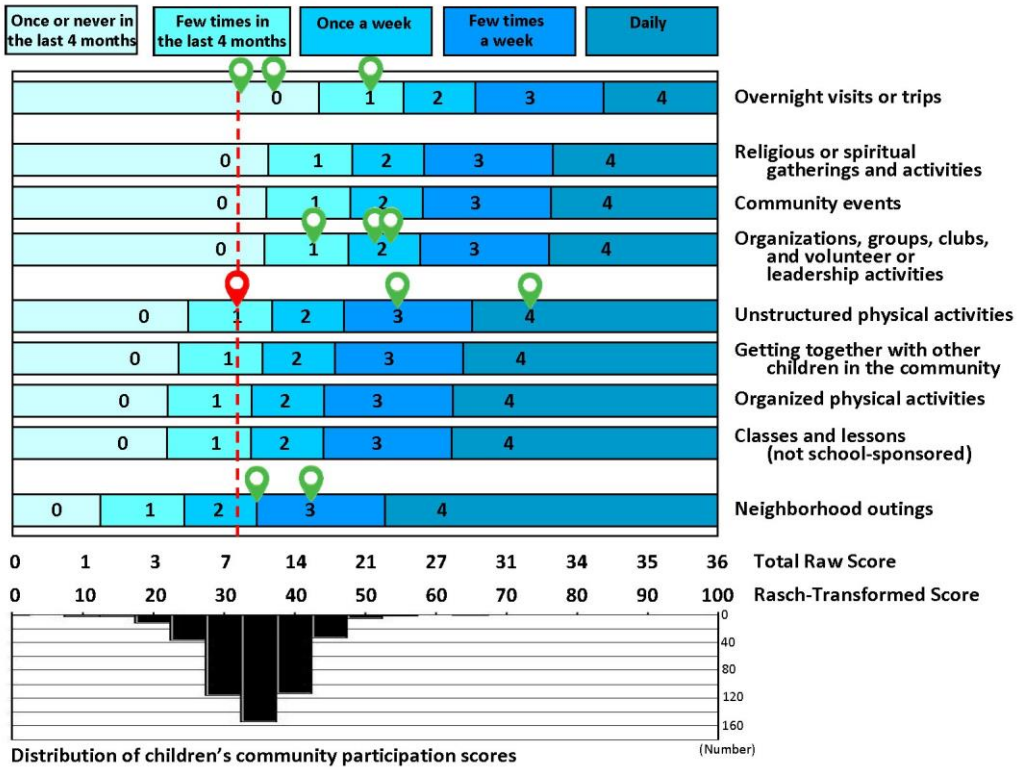

FIGURE 1

Keyform with cutoff scores for children's community participation restriction. Green bookmarks were specified by the clinicians, whereas the red bookmark was the final behavioral criterion for participation restriction. The red dotted line indicates the cutoff value corresponding to the total raw score of 8 and the Rasch-transformed score of 31.6.