



# Children's access to outdoors in early childhood education and care centres in China during the COVID pandemic

Junjie Liu<sup>1</sup> · Shirley Wyver<sup>1</sup> · Muhammad Chutiyami<sup>1,2</sup> · Helen Little<sup>1</sup>

Accepted: 5 October 2023  
© The Author(s) 2023

## Abstract

China has undergone rapid development in early childhood education and outdoor pedagogy in recent times. Importantly, it was the first country to detect COVID-19 cases and introduce lockdowns and other restrictions. Chinese early childhood educators had no opportunities to learn from their peers in other countries regarding how to respond to COVID-19 restrictions. It is unknown how these restrictions may have impacted children's access to the outdoors. The current study examined whether there had been changes in children's outdoor time, access to the outdoor space, and restrictions imposed on children's outdoor play. We then examined if making changes or remaining the same was influenced by educator qualifications, professional development related to outdoor pedagogy, educators' tolerance of risk in play, and staff-child ratios. Most educators reported that the amount of time children spent outdoors and their access to the outdoor space remained the same compared to before the pandemic. A greater number of educators indicated restrictions were imposed on children's outdoor play due to the pandemic. A series of ordinal regression analyses indicated that educators with a higher tolerance of risk in play were more likely to increase children's time spent outdoors and access to outdoor space and impose fewer restrictions on children's outdoor play during the pandemic. A higher staff-child ratio was associated with increasing outdoor time and outdoor space. The findings contribute to the understanding of how external factors influence opportunities for children to play outdoors and provide directions for future professional development programs and risk-reframing interventions.

**Keywords** Early childhood education · COVID-19 pandemic · Outdoor time · Outdoor space · Play restrictions · Educators' tolerance of risk

---

✉ Junjie Liu  
junjie.liu2@students.mq.edu.au

<sup>1</sup> Macquarie School of Education, Macquarie University, Sydney, NSW 2109, Australia

<sup>2</sup> School of Nursing and Midwifery, Faculty of Health, University of Technology Sydney, Sydney, NSW 2007, Australia

## Background

China was the first country to detect cases of COVID-19 and introduce lockdowns and other social restrictions to manage transmission (Johns Hopkins, n.d.). Chinese central and local governments were uniform in their policy responses to COVID-19 to reduce disease transmissions. However, there were local variations in implementation (Li et al., 2021). Despite the variations across local governing contexts, COVID-19 restrictions in China progressed from stringent to relaxed measures. For example, stringent restrictions like lockdowns, closures of schools, public facilities, and transport were implemented initially by the Chinese government (Xu et al., 2020). These restrictions were downscaled to travel contact tracing, mask-wearing, mandatory testing, and strict social distancing measures (Bai et al., 2022). In December 2022, most restrictions were lifted, such as removal of quarantine periods and mandatory COVID-19 testing (Zhao et al., 2023). The pandemic came at a time when China was developing early childhood pedagogy, with a stronger focus on play. Due to COVID-19 restrictions, Chinese early childhood educators had to shift their pedagogy, but the pedagogy focused on play has not been embedded in practice yet (Li & Chen, 2023). It is unknown how these restrictions may have impacted Chinese Early Childhood Education and Care (ECEC). Chinese early childhood educators were trying to manage COVID-19 restrictions for the first time and had no opportunities to learn the experience from other countries.

ECEC in China includes kindergartens for 3–6 years and other childcare centres for children birth–6 years. China has recently increased attention to early childhood education. Curriculum reform has increased alignment with global ECE trends. Changes include children-centredness, play-based learning and teaching, and importing western curricula or pedagogies (Li & Chen, 2023; Niu, 2023). The rapid transformation in Chinese ECEC since 2010 has included an increased number of centres, a higher rate of enrolment and diversity, and an increased number of educators with higher educational backgrounds and attending professional training (Jiang et al., 2022; He et al., 2018; Hui & Chu, 2015). China's approach to outdoor play has undergone significant changes in the past decade, with some initiatives attracting global attention (Liu & Birkeland, 2022). For example, children in Anji (a county in China) are involved in truly self-initiated and self-guided outdoor play and get open time and space to play, which is a breakthrough in China (He, 2018). This approach, known as Anji Play, advocates True Play, which means children deeply engage in uninterrupted outdoor activity (Anji Play, 2019). There is a burgeoning interest in Anji Play aligned with China's movement towards more outdoor time in ECEC (Ministry of Education of the People's Republic of China, 2022) and Anji Play has been recommended by the Chinese Ministry of Education to all parts of the country (Meng & He, 2021).

China's approach to early childhood education is consistent with western outdoor play pedagogy. Western outdoor play pedagogy values the unique learning, risk-taking opportunities, and affordance possibilities provided by the outdoors, including the utilisation of natural outdoor learning environments (Little et al., 2017). This approach to outdoor play, particularly play that is risky and in nature, benefits healthy child development, physical activity, and cognitive development (Brussoni et al., 2015; Dankiw et al., 2020; Sandseter et al., 2017; Sando et al., 2021). Anji Play and

Lijin Play are successful trial cases in China that involve outdoor play with various materials and a different focus. Lijin Play characterised by integrating folk culture into children's outdoor play and Anji play focuses on children's play experience (Niu, 2023). Anji Play also includes elements of risky play initially identified by Sandseter (2007) and recommended in western pedagogy (Brussoni et al., 2012), which includes access to heights such as vertical jumping, walking on a balance beam, and engaging in high-speed activities like high-speed swing, and high-speed running (Lin et al., 2022).

There is emerging evidence that adult tolerance of risk-taking in children's play may influence educators' attitudes toward outdoor play (Brussoni et al., 2022; Bilton, 2020). Tolerance of risk refers to the degree to which adults can tolerate the risk in children's play. To gain an insight into the risk acceptance of educators in children's outdoor play, Hill and Bundy (2014) introduced a tool based on Sandseter's six categories of risky play. The Tolerance of Risk in Play Scale (TRiPS) yields reliable and valid data for measuring adults' tolerance of risk. Ihrig (2020) revised the TRiPS to Teacher Tolerance of Risk in Play Scale (T-TRiPS) for use with prior-to-school teachers. T-TRiPS can be used to help teachers understand their own risk tolerance and serve as a basis for interventions, helping shift teachers' perspectives and increase their risk tolerance. Therefore, it is important to examine if educators' tolerance of risk is related to children's outdoor play opportunities, which can provide directions for future interventions.

Despite China's reforms, a significant gap between Chinese early childhood educators' knowledge of curriculum and the actual pedagogical practices, including play practices, has been documented (Yang & Li, 2022). Hu et al. (2015) found inadequate opportunities for outdoor play, including free play, as well as low level of physical activity by children with an average of only 60 min per day of outdoor activity, even under favourable weather conditions. It is clear from a recent systematic review (Liu et al., 2022) that COVID-19 restrictions were associated with outdoor activity in ECEC contexts internationally. The pandemic impacted the emerging system. The ECEC approach China tried to establish, such as play-based pedagogy, was restricted due to COVID-19 (Park et al., 2020). It affected the whole of society. All families, schools, and children experienced lockdown, isolation, or social restrictions (Rao & Fisher, 2021). The infection rate was lower outdoors (Rowe et al., 2021; Weed & Foad, 2020), and has been communicated worldwide. However, it is unknown if educators were aware of the health advice that being outdoors may lower transmission risks and its impact on outdoor play practices.

In China, early childhood teacher certificates indicate qualified early childhood teachers. Around half of China's ECEC workforce includes qualified early childhood teachers with certificates compared to uncertified educators (Jiang et al., 2017). It is unclear if there is a relationship between early childhood teacher certificates and children's outdoor activity, even though Hu et al. (2016) found that the possession of teacher certificates was not a significant predictor of ECEC program quality. Canadian research has indicated that more frequent professional development and a higher level of education are significantly associated with meeting best outdoor play practices (Predy et al., 2021). However, there is a lack of research in China investigating the relationship between professional development and children's outdoor

activity. In addition to educators' qualifications, the staff-child ratios are also believed to improve child outcomes as it allows for more individual interactions or guidance from the staff. Many researchers have raised concern about staff-child ratios in China and consider this an important area for structural quality improvement. There is a significant discrepancy between rural and urban areas in terms of the ratio of staff to children, with rural regions having more than twice as higher ratios as cities (Zhang & Liu, 2017). The staff shortage in rural regions make it challenging to implement western curricula. In addition, large class sizes and high number of students per staff member has been identified as having a negative impact on outdoor play in Chinese ECEC (Hu et al., 2015). Interestingly, there are no studies that specifically explore how staff-child ratios relate to the amount of time children spend outside, children's access to the outdoor space, or restrictions educators imposed on children's outdoor activity during the pandemic.

The present study examined children's access to outdoor spaces in ECEC in China during the pandemic. The study addressed the following questions:

Compared to pre-COVID-19 conditions:

1. *Was there a change in the amount of time children spent outdoors?*
2. *Was there a change in the space provided for outdoor activity?*
3. *Did educators change their restrictions on outdoor play?*
4. *Were any changes in time, space and restrictions related to educator characteristics or quality indicators (staff qualification, professional development, tolerance of risk and staff-child ratios)?*

## Methods

We used a cross-sectional quantitative design. An online survey was developed to address our research questions. The survey was conducted after COVID-19 restrictions had been imposed and with early childhood educators who had been working in ECEC before the pandemic in China. The survey required educators to recall practices before and during COVID restrictions.

### Survey instrument

The 53-question online survey was designed to collect potential changes in outdoor time, outdoor space, and restrictions imposed on children's outdoor play in Chinese ECEC during the pandemic and to measure educators' tolerance of risk. The full survey is available online from Macquarie University Research Data Repository (Liu et al., 2023b). The survey questions were based on studies included in a systematic review (Liu et al., 2022), and a validated tolerance of risk scale (Ihrig, 2020). We modified the scale for the purpose of the study. There were also six questions from other relevant publications (Grigoropoulos, 2023; Hu et al., 2016; D'Isanto & D'Elia, 2021; Predy et al., 2021; Little, & Sweller, 2015; Lan et al., 2021). The online survey included three parts, educator background and centre characteristics, potential

changes in outdoor activity, and educators' tolerance of risk. The survey was hosted by the LimeSurvey platform.

### **Educator background and centre characteristics**

The first section of the survey included 15 questions regarding educator background and centre information, including gender, age, working experience, qualifications, professional development, educators' knowledge of COVID-19, centre location, age groups, staff-child ratios, and outdoor space. The questions were from previously published studies involving early childhood educators (Grigoropoulos, 2023; Hu et al., 2016; D'Isanto & D'Elia, 2021; Predy et al., 2021; Little, & Sweller, 2015; Lan et al., 2021). The exceptions were the two questions regarding educators' knowledge of COVID-19. We developed the questions to explore if educators were aware of the health advice suggesting that staying outdoors may lower the risk of COVID-19 infections and to determine where they obtained this information.

### **Potential changes in outdoor activity**

Nine questions were used to examine potential changes in children's outdoor activity. These questions had previously been used in research on COVID-related changes in ECEC outdoor activity (Moore et al., 2020, 2021). The educators were asked to compare children's outdoor time and outdoor space before and during the pandemic. For those who reported changes, follow-up questions were included, such as whether there was an increase or a decrease in outdoor time or outdoor space. A five-point Likert scale was used to assess outdoor time, and educators were asked to report if children's outdoor time changed compared to before the pandemic, ranging from 'a lot less' to 'stay the same' to 'a lot more'. The question for outdoor space had a 'yes/no' response. If educators reported changes, they were asked to specify if there were decreases, increases, or something else.

### **Educators' tolerance of risk**

We used a modified version of T-TRiPS to measure educators' tolerance of risk, a set of 25 questions that required a 'yes' or 'no' response, with the option for additional comments to be included (Ihrig, 2020). The T-TRiPS was developed in the USA with preschool and primary teachers working with children with disabilities. The T-TRiPS has since been used in Canadian research with educators working in non-specialist early childhood services (Brussoni et al., 2022; Scoon, 2022). We had previously modified the T-TRiPS for use in Australian ECEC contexts (Liu et al., 2023a) by changing five questions, adding two and deleting five. As a result of these changes, the original 25-item scale was modified to 22 items. For example, 'would you let the majority of your students jump down from a height of 3–4 metres?' was changed to 'would you let the majority of children jump down from a height of 1.8 metres?'. We checked the T-TRiPS with modifications for Australia with two Chinese early childhood educators working in China to ensure consistency with the Chinese ECE context. The adapted T-TRiPS indicated a good internal consistency ( $N=297$ , Cron-

bach  $\alpha=0.90$ ). Inspection of the item-total statistics indicated all 22 items should be retained. We also developed three questions to assess the extent to which educators restrict children's risky or boisterous play due to the pandemic. These questions were structured similarly to the T-TRiPS, with the questions focused on keeping social distancing or restricting physical contact during play and the number of children playing together. The three questions also demonstrated a good internal consistency ( $N=297$ , Cronbach  $\alpha=0.75$ ). Item-total statistics indicated all three items should be retained.

All the authors checked the final survey questions and structure in English. The survey questions were translated into Chinese by the first author, a native Chinese speaker, then checked with three Chinese PhD students studying education and linguistics and two Chinese early childhood educators working in China. Modifications were made based on the suggestions to guarantee the flow of the survey as well as clarity. After the pre-pilot to test the Chinese version of the survey, the revised survey was distributed on social media (WeChat) with the LimeSurvey link and shared by people who teach early childhood education in the university, work as early childhood educators, or used to be early childhood education students in China. Educators who have been working from the pre-pandemic period onwards in Chinese ECEC were eligible to participate. The survey link was open from October 6 to October 31, 2022.

## Participants

The target group was educators working from the pre-pandemic period onwards in Chinese ECEC. A total of 316 responses were collected. Four responses were deleted due to not being an educator or working in a newly built centre. The final sample size was 312, with 303 females and 9 males. Participants were from 22 different regions in China with variations in the economy, population, and climate. Most of them were located in Shandong province, Eastern China ( $N=223$ ). We collected the degree to which the participants find it difficult to recall outdoor practice during the pandemic using a Likert scale from *not difficult* (1) to *extremely difficult* (5), and more educators reported it as not difficult (Not difficult: 48.1%; A little bit difficult: 35.9%; Rather difficult: 9.6%; Very difficult: 2.9%; Extremely difficult: 3.5%). For changes in outdoor space, 302 participants indicated they increased, decreased, or kept the same outdoor space during the pandemic. The remaining 10 educators chose 'other' and did not specify what kind of change occurred. There were 297 valid responses regarding educators' tolerance of risk, and those who work with birth-3 years old were not required to complete this section as the T-TRiPS questions are for pre-schoolers.

## Data analysis

The survey data were exported from LimeSurvey into Excel, where we did the data cleaning and coding. The numerical data were imported into SPSS Version 28 for descriptive and inferential statistics. We conducted ordinal regression analysis to examine the relationship between changes in outdoor time (1=A lot less, 2=A little less, 3=About the same, 4=A little more, 5=A lot more), outdoor space (1=Decrease, 2=Stay the same, 3=Increase), restrictions imposed on children's outdoor play

(0=No restrictions, 1, 2, and 3 represent the higher number, the more restrictions) during the pandemic and early childhood teacher certificate (0=No, 1=Yes), professional development (0=No, 1=Yes), educators' tolerance of risk, and staff-child ratios.

Educators reported intersecting age-groupings with variations in the age ranges (Birth-3, 3-4, 4-5, 5-6, Birth-6, 3-6). Due to the irregularities of the categories, we were unable to use age as a variable in our analyses. As age groups may be important predictors of changes in the amount of time children spent outdoors, access to the outdoor space, and restrictions imposed on children's outdoor play during the pandemic, it was important to determine if there were differences in each of these variables based on age. We conducted the Kruskal-Wallis H test to examine if age groups were significant predictors. The results showed no significant differences for age group and changes in (1) time spent outdoors  $\chi^2(5, N=312)=3.76, p>0.05$ , (2) outdoor space  $\chi^2(5, N=302)=7.60, p>0.05$ , (3) restrictions imposed on outdoor play  $\chi^2(4, N=297)=0.22, p>0.05$ .

### **Ethical considerations**

The project was approved by the Macquarie University Human Research Ethics Committee (Reference No: 520,221,188,140,234). Information about the study was presented on the initial page of the survey, and participation was indicated by ticking a box before beginning the survey. Participants were free to withdraw from the study. Interested participants entered the draw using a separate link to ensure anonymity. All the data collected were stored following ethical guidelines, and only researchers approved in the ethics were permitted to access the data.

## **Results**

### **Educator background and centre characteristics**

Table 1 provides an overview of the background of participants and details of the centres in which they work. It also presents the mean scores and standard deviations of both the dependent and independent variables. Outdoor time, outdoor space changes, and restrictions imposed on children's outdoor play are dependent variables. Independent variables include early childhood teacher certificate, professional development, staff-child ratio, and educators' tolerance of risk.

### **Outdoor time, outdoor space changes, and restrictions during the pandemic in Chinese ECEC**

As shown in Fig. 1, there were changes to children's outdoor time reported by educators. Changes were in both directions, increases and decreases. However, the majority of educators indicated that the amount of outdoor time remained constant compared to before the pandemic. There was a similar result on changes in children's outdoor space. Despite the fact that there were a few educators who decreased or increased

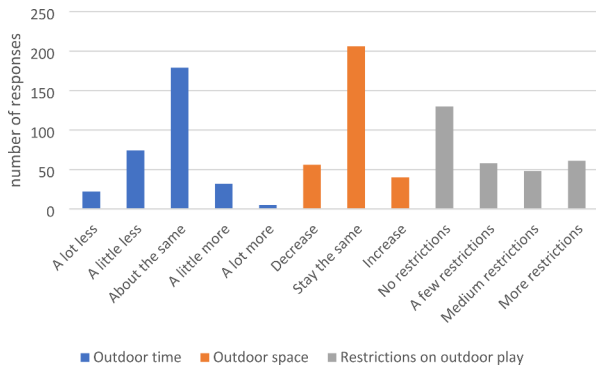
**Table 1** Educator background and centre context

Background	Response	Number/percentage	Mean	Standard deviation
Gender	Female	303/97.1%		
	Male	9/2.9%		
	Total	312		
ECEC working experience	1–3 years	96/30.8%		
	4–7 years	120/38.5%		
	> 7 years	96/30.8%		
	Total	312		
Early childhood teacher certificate	No early childhood teacher certificate	79/25.3%	0.75	0.44
	Early childhood teacher certificate	233/74.7%		
	Total	312		
Professional development on outdoor play	Yes	183/58.7%	0.59	0.49
	No	129/41.3%		
	Total	312		
Health advice suggests that staying outdoors lower the risks of infection	Yes	212/67.9%		
	No	100/32.1%		
	Total	312		
Age group	Birth–3 years old	15/4.8%		
	3–4 years old	83/26.6%		
	4–5 years old	93/29.8%		
	5–6 years old	84/26.9%		
	Birth–6 years old	15/4.8%		
	3–6 years old	22/7.1%		
	Total	312		
Centre location	Rural (< 1000 people)	74/23.7%		
	Small (1000–29,999 people)	80/25.6%		
	Medium (30,000–99,999 people)	83/26.6%		
	Large (≥ 100,000 people)	75/24.0%		
	Total	312		
Outdoor space	Fewer than 4 square metres per child	26/8.3%		
	4 square metres per child	63/20.2%		
	More than 4 square metres per child	111/35.6%		
	Don't know	112/35.9%		
	Total	312		
Staff-child ratio	1:3	1/0.3%	6.28	2.80
	1:4	41/13.1%		
	1:5	22/7.1%		
	1:6	22/7.1%		
	1:7	35/11.2%		
	1:8	38/12.2%		
	1:9	20/6.4%		
	1:10	84/26.9%		
	1:11	1/0.3%		
	1:13	2/0.6%		
	1:15	40/12.8%		
	Total	306		
	Outdoor time	A lot less	22/7.1%	2.76
A little less		74/23.7%		
About the same		179/57.4%		
A little more		32/10.3%		
A lot more		5/1.6%		
Total		312		



**Table 1** (continued)

Background	Response	Number/percentage	Mean	Standard deviation
Outdoor space changes	Decrease	56/17.9%	1.95	0.56
	Stay the same	206/66%		
	Increase	40/12.8%		
	Total	302		
Educators' tolerance of risk total	No early childhood teacher certificate	71/23.9%	8.01	4.77
	Early childhood teacher certificate	226/76.1%	10.95	5.49
	No professional development	118/39.7%	8.40	5.37
	Professional development	179/60.3%	11.46	5.19
	T-TRiPS Total	297	10.25	5.46
Restrictions imposed on children's outdoor play	No restrictions	130/43.8%	1.13	1.19
	A few restrictions	58/19.5%		
	Medium restrictions	48/16.2%		
	More restrictions	61/20.5%		
	Total	297		

**Fig. 1** Changes in outdoor time, space, and restrictions

the outdoor space for children during the pandemic, more educators reported maintaining children's outdoor space as it was. Figure 1 also indicated that, in response to COVID-19 restrictions, a greater number of educators imposed restrictions on children's outdoor play.

### Relationships between changes in outdoor time, space, restriction, and individual characteristics or quality indicators

A series of regressions were conducted to examine the relationships between changes implemented in outdoor time, changes in space, and restrictions imposed on children's play. Outdoor time, outdoor space, and restrictions were all ordinal variables. We therefore used an ordinal regression. Inspection of the distribution of responses showed skewness, so the negative log-log link function was applied.

We ran the analyses with professional development, early childhood teacher certificate, educators' tolerance of risk, and staff-child ratio as the independent variables. Tables 2, 3 and 4 provide the results with all four independent variables included. The regression analyses exclude results from educators working with children birth-3 as the tolerance of risk scale was not relevant to this age group. There were only 288

**Table 2** Ordinal regression analysis for changes in outdoor time (N=297)

Independent variables	Estimate	Std. Error	p-value	CI 95%
Professional development	0.14	0.14	0.33	-0.14-0.41
Early childhood teacher certificate	-0.04	0.16	0.78	-0.35-0.27
Educators' tolerance of risk	0.04	0.01	0.001	0.05-0.15
Staff-child ratio	0.10	0.03	<0.001	0.02-0.07

Pseudo R-square: Nagelkerke 0.12

**Table 3** Ordinal regression analysis for changes in outdoor space (N=288)

Independent variables	Estimate	Std. Error	p-value	CI 95%
Professional development	0.05	0.16	0.73	-0.25-0.36
Early childhood teacher certificate	0.05	0.18	0.77	-0.30-0.40
Educators' tolerance of risk	0.04	0.01	0.01	0.01-0.07
Staff-child ratio	0.07	0.03	0.008	0.02-0.12

Pseudo R-square: Nagelkerke 0.07

**Table 4** Ordinal regression analysis for changes in restrictions imposed on children's play (N=297)

Independent variables	Estimate	Std. Error	p-value	CI 95%
Professional development	0.25	0.17	0.15	-0.09-0.58
Early childhood teacher certificate	-0.20	0.18	0.28	-0.55-0.16
Educators' tolerance of risk	-0.07	0.02	<0.001	-0.10-0.04
Staff-child ratio	-0.01	0.03	0.82	-0.06-0.05

Pseudo R-square: Nagelkerke 0.09

responses regarding changes in children's outdoor space, as some educators did not specify what kind of change occurred.

As shown in Table 2, educators' tolerance of risk and staff-child ratio were both significant in the model. Educators with a higher tolerance of risk were more likely to increase children's outdoor time. There was also an increase in outdoor time when there were more children per staff member. Although professional development did not appear to be a significant factor in the final model, it did have a significant impact on outdoor time when tolerance of risk was not included in the model. There was no significant result regarding early childhood teacher certificate. Even though tolerance of risk and staff-child ratios were the strongest predictors, the Pseudo R<sup>2</sup> indicated the model only accounted for approximately 12% of the variance.

As presented in Table 3, educators' tolerance of risk and staff-child ratio were both significant factors. Educators with a higher tolerance of risk were more likely to increase children's outdoor space. A higher ratio of children to staff members was associated with an increase in children's outdoor space. Professional development and early childhood teacher certificate were not significant variables in predicting potential changes in children's outdoor space during the pandemic. However, the

explained variation in the dependent variable based on our model is approximately 7%.

Table 4 indicated that educators' tolerance of risk was the only significant factor in the model. The results showed that educators with a higher tolerance of risk were less likely to impose restrictions on children's outdoor play during the pandemic. Professional development, early childhood teacher certificate, and staff-child ratios were not significant predictors of educators imposing restrictions on children's outdoor play due to the pandemic. The Pseudo  $R^2$  result indicated the model only accounted for approximately 9% of the variance.

## Discussion

The current study examined the potential changes in children's outdoor time, outdoor space, and restrictions imposed on children's outdoor play in Chinese ECEC during COVID-19. More than two-thirds of educators were aware of the health advice that the outdoors was the better environment to minimise virus transmission. However, the findings showed that most educators kept the same amount of time spent outdoors and did not change children's access to outdoor space. We also found that, compared to before the pandemic, more educators tended to impose restrictions on children's outdoor play. Overall, the results suggest that while the availability of time and space was not changed, additional restrictions were often imposed on the types of play available to children, as reported by the educators.

Changes in outdoor time, outdoor space and restrictions imposed on types of play were found to be associated with educators' tolerance of risk and staff-child ratios. There were no significant results regarding early childhood teacher qualifications. Professional development was initially found to be significant in the ordinal regression model when there were three independent variables, but not as strong in predicting changes in outdoor time as educators' tolerance of risk and staff-child ratios in the final model including four independent variables. Even though the current study did not yield any significant outcomes regarding professional development, previous research suggested an urgent need for improvement in the professional competence of early childhood educators in China when it comes to providing quality outdoor activity (Hu et al., 2015). So, it is still important to offer specific professional development on outdoor play.

This study found that educators' tolerance of risk was positively associated with increasing outdoor time, outdoor space, and fewer restrictions imposed on children's outdoor play during the pandemic. This finding provides further evidence of the significance of reframing educators' tolerance of risk in children's play. Recent research that employed outdoor play risk-reframing tools has indicated that the interventions were effective in increasing early childhood educators' tolerance of risk in play or supporting their outdoor play pedagogy (Brussoni et al., 2022; Soon, 2022). Engaging in risky outdoor play is beneficial for children's healthy development, and it affords ample opportunities to learn how to manage risks (Brussoni et al., 2015). Even though Anji Play has made a great breakthrough regarding risky play (Lin et al., 2022), it takes time for ECEC in other parts of China to learn from the success-

ful experience of Anji Play, especially the transformation of educators' perspectives on risk-taking in play. Thus, the outdoor play risk-reframing tools, which should be adapted to align with the Chinese context, may play an important role in future interventions aimed at increasing educators' tolerance of risk and the associated increased outdoor play opportunities for children in China.

The staff-child ratio was found to be another significant factor in the current study. So far, no studies have been conducted on the relationship between the staff-child ratio and children's outdoor time, outdoor space, or restrictions imposed on children's outdoor play in Chinese ECEC. Findings from this study showed that having more children per staff member tended to increase children's outdoor time and outdoor space. Hu et al. (2015) found that large class sizes and higher staff-child ratios can negatively affect children's outdoor play. The highest staff-child ratio reported in our study was fifteen children per educator, four to five times less than those in rural areas (Zhang & Liu, 2017). In the context of the pandemic, it is possible that the high staff-child ratios were influential in educators to promote outdoor than indoor children's time. This may be related to the fact that it is easier to implement social distancing outdoors than indoors, in line with COVID-19 safety guidelines.

To the best of our knowledge, there is no study examining the influential factors regarding children's outdoor time, access to the outdoor space, and restrictions imposed on children's outdoor play during the pandemic. Therefore, the results obtained from the ordinal regression analysis are exploratory and preliminary. It is important to note that while we detected significant associations with tolerance of risk and staff-child ratios, only a small percentage of the variance was explained. Clearly, there are other factors that have not been considered in our model. The present findings support the importance of tolerance of risk and staff-child ratios in the decisions made by the educators, but this study has not provided the full picture.

The present research adds to the existing literature by showing the difficulties in changing outdoor play practices in ECEC. Findings from the study provide directions for future outdoor play risk-reframing interventions and professional development programs. However, there were a few limitations of the study. Despite more educators reporting that they did not have difficulty recalling their practices pre-pandemic and during the pandemic, it is important to note that the study was cross-sectional and retrospective, relying on a self-reported survey, and may be at risk of recall bias. The limited sample size was another problem as it restricted the number of independent variables to be included in the model. Despite these limitations, the present study remains informative regarding factors that influence Chinese educators' decisions about outdoor activity and play.

## Conclusion

The findings of the study indicate that children's outdoor activity has been impacted by the COVID-19 restrictions. Even though some educators reported changing the time children spent outdoors, the majority of them retained the same amount of outdoor time. Similarly, children's access to outdoor space also remained the same during the pandemic. It is important to note that what changed was restrictions imposed

on children's behaviours within the same outdoor time and space. The current study contributes to the knowledge of children's outdoor time, access to outdoor space, restrictions imposed on children's outdoor play, and its influential factors during the pandemic in Chinese ECEC. The results revealed that the educators did not change the amount of time children spent outdoors or the availability of outdoor space for them despite knowing that it was better to be outdoors than indoors to reduce the risk of COVID-19 transmission. But there were restrictions imposed on children's outdoor play due to the pandemic. Educators with a higher tolerance of risk were more likely to increase children's time spent outdoors, children's access to outdoor space, and place fewer restrictions on children's outdoor play during the pandemic. Therefore, educators' tolerance of risk should be paid more attention. The risk-reframing interventions could serve as effective tools to improve educators' tolerance of risk and create more opportunities for children to play outdoors. A higher staff-child ratio (more children per staff) was associated with a higher likelihood of increasing outdoor time and outdoor space during the COVID-19 restrictions. Although no significant results were found for professional development, we believe educators can benefit from the programs, especially those programs that support educators in more collaborative approaches or focus on specific outdoor play topics. The results also suggest that the Chinese Ministry of Education's endorsement of Anji Play as model for ECEC may play a positive role in supporting educators' tolerance of risk and therefore enhancing children's opportunities to engage in outdoor play with low levels of restriction.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s42322-023-00139-z>.

**Authors' contribution** Conceptualisation, J.L., S.W., M.C. and H.L.; methodology, J.L., S.W., M.C. and H.L.; formal analysis, (data cleaning and coding in SPSS J.L., S.W.; data analysis, J.L., S.W., M.C., H.L.); investigation, J.L.; resources, J.L.; data curation, J.L.; writing—original draft, J.L.; writing—review and editing, J.L., S.W., M.C., and H.L.; visualisation, J.L.; supervision, J.L.; project administration, J.L., S.W., M.C. and H.L.; Validation, J.L., S.W., M.C., and H.L.; funding acquisition, J.L. All authors have read and agreed to the published version of the manuscript.

**Funding** This research was funded by China Scholarship Council—Macquarie University Research Excellence Scholarship (CSC-iMQRES) grant number [202006140005].  
Open Access funding enabled and organized by CAUL and its Member Institutions

## Declarations

**Competing interests** The authors have no competing interests to declare that are relevant to the content of this article.

**Ethics approval** The project was approved by the Macquarie University Human Research Ethics Committee (Reference No: 520221188140234).

**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line

to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

## References

- Anji Play (2019, May 15). *True play statement*. <http://www.anjiplay.com/true-play-statement>.
- Bai, W., Sha, S., Cheung, T., Su, Z., Jackson, T., & Xiang, Y. T. (2022). Optimizing the dynamic zero-COVID policy in China. *International Journal of Biological Sciences*, 18(14), 5314–5316. <https://doi.org/10.7150/ijbs.75699>.
- Bilton, H. (2020). Values stop play? Teachers' attitudes to the early years outdoor environment. *Early Child Development and Care*, 190(1), 12–20. <https://doi.org/10.1080/03004430.2019.1653548>.
- Brussoni, M., Olsen, L. L., Pike, I., & Sleet, D. A. (2012). Risky play and children's safety: Balancing priorities for optimal child development. *International Journal of Environmental Research and Public Health*, 9(9), 3134–3148. <https://doi.org/10.3390/ijerph9093134>.
- Brussoni, M., Gibbons, R., Gray, C., Ishikawa, T., Sandseter, E. B., Bienenstock, A., Chabot, G., Fuselli, P., Herrington, S., Janssen, I., Pickett, W., Power, M., Stanger, N., Sampson, M., & Tremblay, M. S. (2015). What is the relationship between risky outdoor play and health in children? A systematic review. *International Journal of Environmental Research and Public Health*, 12(6), 6423–6454. <https://doi.org/10.3390/ijerph120606423>.
- Brussoni, M., Han, C. S., Lin, Y., Jacob, J., Munday, F., Zeni, M., Walters, M., & Oberle, E. (2022). Evaluation of the web-based outsideplay-ECE intervention to influence early childhood educators' attitudes and supportive behaviors toward outdoor play: Randomized controlled trial. *Journal of Medical Internet Research*, 24(6), e36826–e36826. <https://doi.org/10.2196/36826>.
- D'Isanto, T., & D'Elia, F. (2021). Body, movement, and outdoor education in pre-school during the COVID-19 pandemic: Perceptions of teachers. *Journal of Physical Education and Sport*, 21, 709–713. <https://doi.org/10.7752/jpes.2021.s1087>.
- Dankiw, K. A., Tsiros, M. D., Baldock, K. L., & Kumar, S. (2020). The impacts of unstructured nature play on health in early childhood development: A systematic review. *PloS One*, 15(2), e0229006–e0229006. <https://doi.org/10.1371/journal.pone.0229006>.
- Grigoropoulos, I. (2023). Greek early childhood educators' engagement practices and facilitative roles during free play. *Contemporary School Psychology*, 27(1), 19–28. <https://doi.org/10.1007/s40688-021-00400-6>.
- He, M. (2018). Creating play atmosphere and time for children in Chinese kindergarten: Difficulties and reflection. *Integrative Psychological and Behavioral Science*, 52(3), 351–365. <https://doi.org/10.1007/s12124-018-9445-7>.
- He, H., Li, H., Bao, B., & Zhang, J. (2018). One village, one kindergarten: Exploration of the reform of the publicization and development of preschool education in remote rural area — based on the experience of village kindergarten in Tongren [in Chinese]. *Journal of Shaanxi Xueqian Normal University*, 34(7), 119–123. <https://doi.org/10.11995/j.issn.2095-770X.2018.07.026>.
- Hill, A., & Bundy, A. C. (2014). Reliability and validity of a new instrument to measure tolerance of everyday risk for children. *Child: Care Health & Development*, 40(1), 68–76. <https://doi.org/10.1111/j.1365-2214.2012.01414.x>.
- Hu, B. Y., Li, K., De Marco, A., & Chen, Y. (2015). Examining the quality of outdoor play in Chinese kindergartens. *International Journal of Early Childhood*, 47(1), 53–77. <https://doi.org/10.1007/s13158-014-0114-9>.
- Hu, B. Y., Mak, M. C. K., Neitzel, J., Li, K., & Fan, X. (2016). Predictors of Chinese early childhood program quality: Implications for policies. *Children and Youth Services Review*, 70, 152–162. <https://doi.org/10.1016/j.childyouth.2016.09.013>.
- Hui, J., & Chu, Y. (2015). Characteristics of quality preschool teachers' training [in Chinese]. *Education Exploration*, (6), 142–145.
- Ihrig, K. (2020). *Teacher tolerance of risk in play scale (T-TRiPS): Evaluating the psychometric properties of a new measure* [Doctoral dissertation, Colorado State University]. ProQuest Dissertations & Theses Global. <https://www.proquest.com/docview/2547498463?pq-origsite=gscholar&fromopenview=true>

- Jiang, Y., Pang, L., & Sun, J. (2017). Early childhood teacher education in China. In Rao, N., Zhou, J., & Sun, J. (Eds.), *Early Childhood Education in Chinese Societies* (pp. 85–100). Springer Netherlands. [https://doi.org/10.1007/978-94-024-1004-4\\_6](https://doi.org/10.1007/978-94-024-1004-4_6).
- Jiang, Y., Zhang, B., Zhao, Y., & Zheng, C. (2022). China's preschool education toward 2035: Views of key policy experts. *ECNU Review of Education*, 5(2), 345–367. <https://doi.org/10.1177/20965311211012705>.
- Johns Hopkins University & Medicine. (n.d.). *COVID-19 dashboard*. <https://coronavirus.jhu.edu/map.html>.
- Lan, S., Jiang, Y., Di, H., Li, H., Zhou, J., & Li, F. (2021). Development and validation of the Chinese kindergarten teacher quality scale in Shanghai. *Children and Youth Services Review*, 131, 106272. <https://doi.org/10.1016/j.childyouth.2021.106272>.
- Li, P. H., & Chen, J. J. L. (2023). *The globalization of early childhood curriculum: Global childhoods, local curricula*. Routledge. <https://doi.org/10.4324/9781003274865>.
- Li, A., Liu, Z., Luo, M., & Wang, Y. (2021). Human mobility restrictions and inter-provincial migration during the COVID-19 crisis in China. *Chinese Sociological Review*, 53(1), 87–113. <https://doi.org/10.1080/21620555.2020.1821183>.
- Lin, W., Wu, J., Wu, Y., & He, H. (2022). Development of teacher rating scale of risky play for 3- to 6-year-old pre-schoolers in Anji Play kindergartens of east China. *International Journal of Environmental Research and Public Health*, 19(5), 2959. <https://doi.org/10.3390/ijerph19052959>.
- Little, H., & Sweller, N. (2015). Affordances for risk-taking and physical activity in Australian early childhood education settings. *Early Childhood Education Journal*, 43(4), 337–345. <https://doi.org/10.1007/s10643-014-0667-0>.
- Little, H., Elliott, S., & Wyver, S. (2017). Why do outdoor play and learning matter? In H. Little, S. Elliott, & S. Wyver (Eds.), *Outdoor learning environments*. Allen & Unwin.
- Liu, J., & Birkeland, Å. (2022). Perceptions of risky play among kindergarten teachers in Norway and China. *International Journal of Early Childhood*, 54(3), 339–360. <https://doi.org/10.1007/s13158-021-00313-8>.
- Liu, J., Wyver, S., & Chutiyaami, M. (2022). Impacts of COVID-19 restrictions on young children's outdoor activity: A systematic review. *Children*, 9(10), 1564. <https://doi.org/10.3390/children9101564>.
- Liu, J., Wyver, S., Chutiyaami, M., & Little, H. (2023a). Outdoor time, space, and restrictions imposed on children's play in Australian early childhood education and care settings during the COVID pandemic: A cross-sectional survey from educators' perspective. *International Journal of Environmental Research and Public Health*, 20(18), 6779. <https://doi.org/10.3390/ijerph20186779>.
- Liu, J., Wyver, S., Little, H., & Chutiyaami, M. (2023b). The survey copy that was used in a Ph.D. project to examine potential changes in children's outdoor activity in Australian early childhood education and care centres due to COVID-19 restrictions and to measure educators' tolerance of risk in children's play. (Version 1). Dataset. *Macquarie University*. <https://doi.org/10.25949/24145362.v1>.
- Meng, W., & He, M. (2021). Utilisation and design of kindergarten outdoor space and the outdoor activities: A case study of kindergartens in Bergen, Norway and Anji in China. In Grindheim, L. T., Sørensen, H. V., & Rekers, A. (Eds.), *Outdoor Learning and Play Pedagogical Practices and Children's Cultural Formation* (Vol. 34). (pp. 95–110). Springer Nature. [https://doi.org/10.1007/978-3-030-72595-2\\_12](https://doi.org/10.1007/978-3-030-72595-2_12).
- Ministry of Education of the People's Republic of China (2022, February 11). *Guidelines for assessing the quality of kindergarten care and education*. [http://www.moe.gov.cn/srcsite/A06/s3327/202202/t20220214\\_599198.html](http://www.moe.gov.cn/srcsite/A06/s3327/202202/t20220214_599198.html) (in Chinese).
- Moore, S. A., Faulkner, G., Rhodes, R. E., Brussoni, M., Chulak-Bozzer, T., Ferguson, L. J., Mitra, R., O'Reilly, N., Spence, J. C., Vanderloo, L. M., & Tremblay, M. S. (2020). Impact of the COVID-19 virus outbreak on movement and play behaviours of Canadian children and youth: A national survey. *The International Journal of Behavioral Nutrition and Physical Activity*, 17(1), 85–85. <https://doi.org/10.1186/s12966-020-00987-8>.
- Moore, S. A., Faulkner, G., Rhodes, R. E., Vanderloo, L. M., Ferguson, L. J., Guerrero, M. D., Brussoni, M., Mitra, R., O'Reilly, N., Spence, J. C., Chulak-Bozzer, T., & Tremblay, M. S. (2021). Few Canadian children and youth were meeting the 24-hour movement behaviour guidelines 6-months into the COVID-19 pandemic: Follow-up from a national study. *Applied Physiology Nutrition and Metabolism*, 46(10), 1225–1240. <https://doi.org/10.1139/apnm-2021-0354>.
- Niu, C. (2023). Research on play-based kindergarten curriculum reform in China: Based on the analysis of three typical play modes. *International Journal of Early Years Education*, 31(2), 401–418. <https://doi.org/10.1080/09669760.2023.2168520>.

- Park, E., Logan, H., Zhang, L., Kamigaichi, N., & Kulapichitr, U. (2020). Responses to coronavirus pandemic in early childhood services across five countries in the Asia-Pacific region: OMEP policy forum. *International Journal of Early Childhood*, 52(3), 249–266. <https://doi.org/10.1007/s13158-020-00278-0>.
- Preddy, M., Holt, N., & Carson, V. (2021). Examining correlates of outdoor play in childcare centres. *Canadian Journal of Public Health*, 112(2), 292–303. <https://doi.org/10.17269/s41997-020-00404-4>.
- Rao, N., & Fisher, P. A. (2021). The impact of the COVID-19 pandemic on child and adolescent development around the world. *Child Development*, 92(5), e738–e748. <https://doi.org/10.1111/cdev.13653>.
- Rowe, B. R., Canosa, A., Drouffe, J. M., & Mitchell, J. B. A. (2021). Simple quantitative assessment of the outdoor versus indoor airborne transmission of viruses and COVID-19. *Environmental Research*, 198, 111189–111189. <https://doi.org/10.1016/j.envres.2021.111189>.
- Sando, O. J., Kleppe, R., & Sandseter, E. B. H. (2021). Risky play and children's well-being, involvement and physical activity. *Child Indicators Research*, 14(4), 1435–1451. <https://doi.org/10.1007/s12187-021-09804-5>.
- Sandseter, E. B. H. (2007). Categorising risky play—how can we identify risk-taking in children's play? *European Early Childhood Education Research Journal*, 15(2), 237–252. <https://doi.org/10.1080/13502930701321733>.
- Sandseter, E. B. H., Little, H., Ball, D., Eager, D., & Brussoni, M. (2017). Risk and safety in outdoor play. In T. Waller, E. Årlemalm-Hagsér, E. B. H. Sandseter, L. Lee-Hammond, K. Lekies, & S. Wyver (Eds.), *The SAGE handbook of Outdoor Play and Learning* (pp. 113–126). SAGE Publications. <https://doi.org/10.4135/9781526402028.n8>.
- Scoon, V. J. (2022). *The perspectives of early childhood education and care practitioners in British Columbia on their outdoor play pedagogy* [Doctoral dissertation, University of British Columbia]. DSpace. <http://hdl.handle.net/2429/81215>.
- Weed, M., & Foad, A. (2020). Rapid scoping review of evidence of outdoor transmission of COVID-19. *MedRxiv*, 2020-09, <https://doi.org/10.1101/2020.09.04.20188417>.
- Xu, W., Wu, J., & Cao, L. (2020). COVID-19 pandemic in China: Context, experience and lessons. *Health Policy and Technology*, 9(4), 639–648. <https://doi.org/10.1016/j.hlpt.2020.08.006>.
- Yang, W., & Li, H. (2022). Curriculum hybridization and cultural glocalization: A scoping review of international research on early childhood curriculum in China and Singapore. *ECNU Review of Education*, 5(2), 299–327. <https://doi.org/10.1177/20965311221092036>.
- Zhang, L., & Liu, Q. (2017). Early childhood education in economically disadvantaged rural areas of China. In Rao, N., Zhou, J., & Sun, J. (Eds.), *Early Childhood Education in Chinese Societies* (pp. 111–130). Springer Netherlands. [https://doi.org/10.1007/978-94-024-1004-4\\_8](https://doi.org/10.1007/978-94-024-1004-4_8).
- Zhao, S., Sha, T., Xue, Y., & Chen, H. (2023). Flattening the curve: Imperative when China eases the severe COVID-19 control policy. *The Journal of Infection*, 86(3), e75–e77. <https://doi.org/10.1016/j.jinf.2022.12.022>.

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

**Junjie Liu** is currently pursuing a doctoral degree in early childhood education from Macquarie School of Education, Macquarie University, Sydney, Australia. She received her master's degree in education from the faculty of education at East China Normal University, Shanghai, China, in 2020. Her research interests include playing in outdoor environments and playing outside with risk-taking opportunities.

**Shirley Wyver** is a Senior Lecturer in child development at the Institute of Early Childhood, Macquarie University, Australia. She is also a registered psychologist. Her research interests are in early play and cognitive/social development. She also conducts research in the area of blindness/low vision and development.

**Muhammad Chutiyami** is a registered nurse and a lecturer at the School of Nursing and Midwifery, University of Technology Sydney. Chutiyami has an educational background in nursing, public health and education. Chutiyami's research areas cut across a broad range of community health and primary health-care, including vaccinations, sociocultural determinants of health, infectious diseases, health education/promotion and community-based interventions.



**Helen Little** is a Senior Lecturer in early childhood education in the School of Education, Macquarie University where she teaches child development and outdoor learning. Helen is the Course Director for the Master of Teaching (birth to 5 years). Her research interests are in outdoor learning environments and pedagogy with a particular focus on risk-taking in play.