



The Prevalence of Risky Play in Young Children's Indoor and Outdoor Free Play

Ellen Beate Hansen Sandseter¹ · Rasmus Kleppe² · Ole Johan Sando¹

Published online: 25 June 2020
© The Author(s) 2020

Abstract

Research on children's risky play and young children's risk taking is a relatively new research area that has drawn the attention of many researchers in the last decades. Nevertheless, to our knowledge, no earlier studies have measured the prevalence of risky play when children can freely choose what to play, with whom, and where. Most research on risky play has also exclusively focused on outdoor play. This study aims at examining the occurrence and characteristics of children's risky play, indoors and outdoors, in early childhood education and care (ECEC) institutions. Children (N = 80) were observed in two-minute sequences during periods of the day when they were free to choose what to do. The data consists of 1878 randomly recorded two-minute videos, which were coded second by second for the occurrence of several categories of risky play. Results revealed that risky play was registered in 10.3% of the total data material. The data is further analysed to explore distribution among different types of risky play, as well as differences between gender, age and environment (indoors vs. outdoors).

Keywords Risky play · Occurrence · ECEC institutions · Gender · Age · Play environment

Introduction

A growing number of studies show that children's opportunities for free play have decreased in the last few decades (see e.g. Freeman 1995; Lester and Maudsley 2006; Brussoni et al. 2012; Moss 2012; Gray 2011). Childhood has changed, and children's daily lives are now characterized more by sedentary indoor activities than outdoor play and physical activity (Kemple et al. 2016). The concern for the decline in children's play is also emphasized in the UN Committee on the Rights of the Child, General comment no. 17 (UN 2013). The UN Committee expresses great concern about this increasing problem, and points at safety concerns and an excessive and restrictive safety focus as one of the reasons for this problem, as well as increasing pressure on learning and academic achievement on young children (UN 2013). In line with this, a number of international studies

on outdoor play suggest that children's opportunities for learning about risk and safety are often limited (Bundy et al. 2009; Little and Eager 2010; Little 2015; Brussoni et al. 2012; Waters and Begley 2007; Sandseter et al. 2019). Most of the time, play occurs under adult supervision; therefore, decisions regulating what children are allowed to do and where they are allowed to go (Kytä 2004) are often decided by adults. This is also the case in early childhood and care (ECEC) settings.

While adults tend to become more risk-averse, children still have a great appetite for risky play. Intense exhilaration is one of the potential rewards of engaging in risky situations (Cook 1993; Cook et al. 1999). Feelings such as fun, enjoyment, excitement, thrill, pride, achievement, and good self-esteem when mastering new and challenging tasks are found to be a driving force and rewarding experience when children engage in risky play (Sandseter 2010b, a; Coster and Gleave 2008; Stephenson 2003). Risk-taking in play includes both fear and excitement, and this ambiguous feeling is what children seek in their play (Cook 1993; Aldis 1975; Cook et al. 1999; Sandseter 2010a; Coster and Gleave 2008; Stephenson 2003). As such, there is reason to believe that children will seek this kind of play, no matter

✉ Ellen Beate Hansen Sandseter
ebs@dmmh.no

¹ Queen Maud University College of Early Childhood Education, Trondheim, Norway

² Oslo Metropolitan University, Oslo, Norway

how safe we try to make their daily lives (Sandseter and Kennair 2011).

Risky Play

A common definition of risky play is: “thrilling and exciting forms of physical play that involve uncertainty and a risk of physical injury” (Sandseter 2010b). Eight categories of risky play have been identified through observations and interviews with children and ECEC practitioners (Sandseter 2007, 2009b; Kleppe et al. 2017): (1) Play with great heights—danger of injury from falling, such as all forms of climbing, jumping, hanging/dangling, or balancing from heights; (2) Play with high speed—uncontrolled speed and pace that can lead to a collision with something (or someone), for instance bicycling at high speeds, sledging (winter), sliding, running (uncontrollably); (3) Play with dangerous tools—that can lead to injuries, for instance axe, saw, knife, hammer, or ropes; (4) Play near dangerous elements—where children can fall into or from something, such as water or a fire pit; (5) Rough-and-tumble play—where children can harm each other, for instance wrestling, fighting, fencing with sticks; (6) Play where children go exploring alone, for instance without supervision and where there are no fences, such as in the woods; (7) Play with impact—children crashing into something repeatedly just for fun; and (8) Vicarious play—children experiencing thrill by watching other children (most often older) engaging in risk. Risky play and risk-taking activities are found in a great span of ages, including 1–3-year-olds (Kleppe et al. 2017), 4–6-year-olds (Sandseter 2007) and 4–13-year-olds (Coster and Gleave 2008).

Even though research on risky play and young children’s risk-taking is a relatively new research area, researchers have, during the last decades, been interested in the possible benefits of risky play to children’s development and learning. This research indicates that risky play can lead to increased physical activity, improved motor/physical competence (Brussoni et al. 2015; Fjørtoft 2000), higher ability to assess risks and handle risk situations in an appropriate way (Ball 2002; Boyesen 1997; Lavrysen et al. 2015) and positive psychological outcomes (Brussoni et al. 2015; Sandseter and Kennair 2011) and general health (Brussoni et al. 2015).

Cultural Differences

How caregivers and adults carry out supervision of children is culturally dependent (Little 2008; Guldberg 2009; Jolleyman et al. 2019). Previous studies have found parents and teachers from Norway and Canada to be less risk-averse than those in the United States and Australia

(Watchman and Spencer-Cavaliere 2017; Little et al. 2012; Watson et al. 2013). In line with this, a recent study of barriers for children’s outdoor play in five European countries (Sandseter et al. 2019) found that parents and ECEC practitioners in Norway are less risk-averse to children’s play than those from the southern European countries. Handling children’s risky play in ECEC is not an easy and straight forward issue, and there are several factors that contribute to teachers being somewhat risk averse in their practice. Guldberg (2009), argues that Norwegians have a special love for outdoor pursuits and are reluctant to restrict children’s freedom to roam outdoors—without adults watching them—to the same extent that other nations do. Similarly, New et al. (2005) point out that Norwegian, Swedish, Danish, and to some extent, Italian preschool teachers have fewer concerns about children’s risk-taking than do American preschool teachers. Little et al. (2012) found that Scandinavian, and particularly Norwegian, ECEC practitioners are more liberal towards children’s risky play than practitioners in Australia. Explanations might be found in different theoretical-pedagogical approaches (Sandseter et al. 2012) but are certainly also rooted in cultural beliefs and values, often related to varying emphasis on outdoor play and learning between countries (Guldberg 2009). Also, different perceptions of accountability and fear of litigation play a role in how ECEC practitioners handle children’s risky play. Norwegian practitioners, working in a less litigious context (Norway), report that they sometimes worry about the potential for injury among children, but not for being sued by parents or looked upon as a bad practitioner (Sandseter 2012). On the other hand, ECEC teachers and practitioners from other countries report being held accountable for children’s injuries and the risk of litigation is an important factor for them being restrictive towards children’s risk-taking in play (Bundy et al. 2009; Little et al. 2011). Another factor that influences children’s opportunities for risky play between cultures is differences in rules and regulations for playground design (Herrington and Nicholls 2007; Ball 2004; Spiegel et al. 2014).

Looking more closely at the Norwegian ECEC and its curriculum, *The Framework Plan for Kindergartens—contents and tasks* (NMER 2017), the emphasis is very strong on children’s right to participate, to be responsible, and to be active. Children shall be able to express their views on the day-to-day activities of the ECEC and have a large degree of freedom in terms of choosing activities. In Norway, children’s right to play is regarded as an important element of the content, and ECEC shall make good provisions for play, friendship, and children’s own culture, and provide opportunities for both indoor and outdoor play (NMER 2017). It is also emphasized that ECEC institutions “shall ... help the children to... evaluate and master risky play through

physical challenges” (NMER 2017). The *Framework Plan* (NMER 2017) also has a focus on being outdoors, and children attending Norwegian ECEC institutions usually spend more than 70% of the total time in ECEC outdoors in the summer semester, and more than 30% of the total time in the winter semester (Moser and Martinsen 2010).

To What Extent do Children Engage in Risky Play?

To our knowledge, there are no earlier studies measuring/mapping the prevalence of risky play when children can choose what to play, with whom and where. In one study, Sandseter (2009a) compared risky play among children in an outdoor ECEC institution with children in an ordinary institution and counted the incidents of risky play in the two settings. However, the data collection in this study particularly focused on risky play situations and recorded all risky play situations that appeared across the participating children. In other words, the numbers do not represent a measure of the actual prevalence of risky play during a child’s day in ECEC. In another study, Sandseter (2014) asked 117 ECEC practitioners how often, based on their experience, children (boys and girls) engaged in risky play. Practitioners reported that 55% of the boys and 38% of the girls engaged in risky play once a day or more. Still, this was based on practitioners’ perceptions and not on actual engagement in risky play. Similarly, a study in New Zealand (Jelleyman et al. 2019) asked parents about their children’s engagement in risky activities and found that 73% of respondents stated that their 5–12-year-old children seldom or never engaged in four or more risky activities, and only 14.3% engaged in four more often or always. Occurrence and characteristics have also been observed and mapped among children under 3 years (Kleppe 2018; Stephenson 2003), but only in small samples.

Therefore, despite the growing interest in research on children’s risky play, we are missing large-scale research on the prevalence of this kind of play in contexts where children can freely choose what to play, including how this is distributed between different kinds of risky play, children’s age and gender. There is also an apparent lack of research on risky play in indoor environments.

Aim of the Study

Based on the aforementioned lack of research, and with Norway being a good context to investigate risky play due to the more liberal approach to children’s risky play, even in ECEC, this study aims at examining occurrence and

characteristics of children’s risky play in ECEC when children are free to choose what to play.

Research questions:

- Q1: What is the prevalence of risky play during free play in eight Norwegian ECEC institutions?
- Q2: How is the frequency of risky play associated with individuals, gender, age and environment (outdoor/indoor)?

Method

This study is part of the Competence for Developing Early Childhood Education and Care (ECEC) Institutions’ Indoor and Outdoor Environments project, funded by the Research Council of Norway and approved by the Norwegian Social Science Data Services. Lasting from 2017 to 2020, the project was conducted in close collaboration with three owners of ECEC institutions in Norway. Data collection involved systematic and randomized video observations of children in indoor and outdoor environments during free play at two data points, in which *free play* implied that children could decide what they wanted to do, where they wanted to be and with whom they want to interact. Results from the first period of data collection have been published elsewhere (Storli and Sandseter 2019).

Participants

The participating ECEC institutions in the study were selected from facilities operated by three partnering ECEC owners. The owners made at least twice as many ECEC institutions available as were required for the study and provided relevant information about each of them, including their size, location, age, spatial qualities, number of departments and number of children in attendance. An important criterion for selected institutions was having at least 20 children aged 4 to 5 years old who could be recruited as participants. A selection of eight ECEC institutions was made based on a strategic choice to include different types of institutions in terms of the size, age of the institution, location and physical environment. The selected institutions had from 56 to 117 children, were built between 1989 and 2016, and were located in the north, middle, and south of Norway. The outdoor physical environment ranged from small (750 square meters) urban playgrounds to large (13 000 square meters) natural environments. However, all outdoor playgrounds included fixed playground equipment like swings, slides, sandpits, and climbing equipment, as well as play materials like tricycles, buckets, toy trucks, cups, and spades. All participating institutions followed the Norwegian norm of 4 square meters indoor space per child from 3 years of age (Utdanningsdirektoratet 2012) and were thus similar in size

adjusted to the number of children in the institution. The ECEC institutions' indoor environment consisted of a mix of spaces dedicated for smaller groups and spaces for common use of all groups; all spaces with a variety of furniture, materials and toys, and designed to house a wide range of play and daily activities for the children and staff.

The strategy for sampling children to participate was to randomly draw ten children—five boys and five girls—from each institution. Once informed consent from all the children's parents was obtained, five girls and five boys who consented to participate were randomly selected from each institution. As a result, the first period of data collection (T1) included 80 children. Because the second period of data collection (T2) occurred a year after T1, some amendments were made to the sample at T2. In particular, six of the 80 participants no longer attended the institutions at T2, and one child was not included at T2 for ethical reasons. Following the likelihood of dropout anticipated at T1, a list of other children who consented to participate was used to randomly select seven additional children for T2 to replace the ones who dropped out of the study. However, one of the children was sick on the day of observation, which left only six children as replacement participants. Ultimately, the sample consisted of 86 children: 80 at T1 and 79 at T2. The distribution of gender between T1 and T2 was nearly equal, with 51% of the observations being of boys and 49% being of girls. Children's mean age was 3.8 years ($SD=0.6$) at T1 and 4.7 years ($SD=0.6$) at T2.

Procedure and Data

T1 occurred in the fall of 2017, whereas T2 occurred a year later in the fall of 2018 among the same children observed at T1. All observations were video-recorded and performed in accordance with a strict protocol that ensured a random sampling of observational sequences and identical methods of data collection at each institution. One ECEC teacher from each institution was recruited as a co-researcher and conducted the filming, while the project researcher wrote field notes and ensured that the protocol was followed. Two children were selected to be observed on each day of observation, and each child was observed for six, two-minute sequences during free play outdoors and indoors. The protocol instructed the data collector to perform each observation by recording Child 1 for 2 min, followed by a 6-min break to locate the next child in the play area. Next, Child 2 was recorded for 2 min as well, followed by another 6-min break to locate Child 1 for his or her second round of observation, and so forth. If the data collector encountered a child in a situation that could not be filmed (e.g., using the toilet or changing clothes), then the observation was postponed until filming was permitted. If the child was in such a situation for more than 10 min, then the data collector proceeded to

continue observing the other child and performed the missing observations at the end of the observation period.

The final sample included 950 observations at T1 and 928 observations at T2, with an average of 21.8 ($SD=4.3$) observations per child. This means that 42 observations are missing. Missing observations occurred because children were sick or picked up early from ECEC, while other observations were excluded because the child was hidden from view, was preoccupied with the recording equipment, or because a technical or human error occurred.

The number of missing video observations is low and does not represent a methodological challenge for the present study.

Ethical Considerations

There are special ethical issues in research involving young children (Fine and Sandstrom 1988). One of these issues is the need to gain informed consent from both the parents and the children (for the children also in situ before each observation). It is important to ensure that the children understand both their own and the researcher's role during the data collection and that they can withdraw from the project at any time (Grieg et al. 2007). The co-researchers in this study, who knew the children well, explained to each child in an understandable way the observations that would be conducted and informed them of their right to withdraw at any time. The researchers were also very conscious to refrain from recording children in sensitive situations such as toileting, changing clothes, etc.

The study was approved by the Data Protection Official for Research in Norway, under the premise that the data would not be analysed or published at centre level due to the relatively low number of children in each institution.

Coding of Risky Play

Risky play was coded using the Observer XT 12.5 behaviour coding (Noldus), analysis and management software for observation data (Zimmerman et al. 2009). This software allows for second-by-second coding of videos. This means that assessors were able to code instances and duration of the various types of risky play. The three assessors were the authors of this article, all with more than 7 years of experience of research on children's risky play. The assessors independently coded a part of the video material according to recent categories of risky play (Sandseter and Kleppe 2019), (Table 1).

Since risky play was coded second-for-second in each of the observations, common measures to evaluate interrater reliability (e.g., kappa, correlation, ICC) were not used. To evaluate the consistency among the three assessors, each assessor critically reviewed a random sample of the two

Table 1 Categories of risky play with examples

1. Play with great heights	<ul style="list-style-type: none"> • In the outdoor environment, this would be situations where children climbed trees, climbing towers, play hut roofs, or they jumped down from high places such as roofs, play equipment platforms, jumping between tables, etc. • In the indoor environment, this would be situations where children climbed on and jumped down from climbing walls, wall bars, shelves or high tables, high stocks of large building materials etc.
2. Play with high speed	<ul style="list-style-type: none"> • In the outdoor environment, this would be situations where children slide down slides or hills, swung at high speed, and rolled down steep hills sitting on a tricycle, car toy or doll trolley, etc. Cycling, sliding, or swinging with low speed was not considered risky play • In the indoor environment this would be situations where the children were running in high speed and sliding down indoor slides, etc.
3. Play with dangerous tools	<ul style="list-style-type: none"> • In both the outdoor and indoor environment this would be situations where children played with ropes, pounded hammers and nails, whittled with knives, or used saws and axes, etc. Using kitchen knives for e.g. sandwich spread was not considered risky play
4. Play near dangerous elements	<ul style="list-style-type: none"> • In the outdoor environment this would be situations where children played near dangerous elements such as steep cliffs, deep water, fire pits, etc. • This category is not relevant indoors
5. Rough-and-tumble play (R&T)	<ul style="list-style-type: none"> • In both the outdoor and indoor environment this would be situations where children engaged in play fighting, play wrestling, play fencing, chase-and-catch play etc.
6. Play where children go exploring alone	<ul style="list-style-type: none"> • In the outdoor environment, this would be situations where children were allowed to wander off into the forest or the neighbourhood without constant supervision of staff • This category is not relevant indoors. Due to the nature of this study where we only observed children within the fenced playground, we did not expect to find instances of this category
7. Play with impact	<ul style="list-style-type: none"> • In the outdoor environment, this would be situations where children repeatedly crashed their tricycle, trolley or other wheeled toy into the fence or a wall, or where they crashed the swing into the pole of the swing set, etc. • In the indoor environment, this would be situations where children repeatedly ran and crashed into a mattress or pile of pillows, or threw mattresses, pillows or other objects on each other, etc.
8. Vicarious play	<ul style="list-style-type: none"> • In both the outdoor and indoor environment this would be situations where children observed other children taking risks in play, and where the observing child showed clear signs of being exhilarated by what he or she observed

other assessor's initial coding. Among the 375 observations in which risky play was coded, as many as 160 observations were reviewed by a second assessor. In 120 of these observations (75%), no comments to the initial coding were made. In 29 of the observations (18%) comments on when to start or stop the coding of a specific category were made. In 11 observations (7%) comments on what category of risky play that was most appropriate to use were made. The 40 observations with comments were reviewed jointly by all three assessors to discuss the second assessors' comments, and to reach a mutual understanding of the use of categories and when to start or stop coding. Following these discussions, minor adjustments to the full sample of observations were made to ensure consistent use of the categories.

Analysis

To address the research questions, a series of analyses was run. Prevalence was examined through descriptive statistics, including distributions, frequencies, means and standard deviations (Morgan et al. 1999). To examine associations between risky play and age, gender, and environment, multi-level regression was conducted (Goldstein 1986). Analyses were completed using SPSS 26 (IBM SPSS Statistics for Windows, Version 26.0. IBM Corp., Armonk, NY) and Stata 14.2 (StataCorp, College Station, TX, USA). There were no issues with missing data or outliers that required specific analytic strategies in this study.

Table 2 Mean prevalence of risky play in percentage (SD) during children's free play

	Total (N=1878)	Boys (N=955)	Girls (N=923)	Indoor (N=943)	Outdoor (N=935)
Risky play	10.3 (25.3)	11.7 (26.4)	9.0 (24.0)	7.5 (21.8)	13.2 (28.1)
Heights	4.1 (16.1)	4.1 (15.5)	4.1 (16.7)	3.4 (14.1)	4.8 (17.9)
Speed	2.9 (13.8)	3.3 (15.2)	2.4 (12.2)	0.1 (2.0)	5.6 (19.1)
R&T	2.7 (13.6)	3.8 (15.8)	1.6 (10.8)	3.6 (15.8)	1.8 (10.8)

Results

Risky play is registered in 20% of all observations ($n = 1878$), and the mean time spent in risky play is 10.3% (Table 2). Of the eight risky play categories, two categories—play near dangerous elements and play where children go exploring alone—were not observed at all. Among the six categories observed, the prevalence was as follows (mean % of time spent in risky play in descending order): height (4.1%), speed (2.9%), R&T (2.7%), tools (0.4%), impact (0.2%), and vicarious (0.2%). Play with heights is the largest category, while time spent in play with speed and R&T is almost equal. Children spent proportionally very little time engaged in play with tools, impact, and vicarious risk, and these were therefore left out of the further analysis.

Children engaged in risky play to a varying degree. Four of the 86 children did not engage in risky play, while the child with the most risky play registered spent 29.7% of the observed time in risky play. Intraclass correlation analysis based on the multi-level regression model estimates, however, found that only 2% of the variance in risky play is at the child level. Similar variances at the child level were identified for heights (1%), speed (2%) and R&T (3%). This finding indicates that many children engage in risky play, and that the variance in risky play is mostly at the observational level.

Multi-level regression analysis was used to examine significant associations between the prevalence of risky play and age, gender, and environment (Table 3). Models with variables describing age, gender and environment were fitted separately for the total amount of risky play and the specific categories for heights, speed and R&T.

The multi-level regression model indicates that the total amount of risky play is positively associated with age ($b = 2.6$, $p = 0.081$) and being outside ($b = 5.7$, $p = 0.000$). There are no significant differences between boys and girls in

total engagement in risky play. Similarly, playing in heights is not significantly associated with gender, but is positively associated with age ($b = 2.0$, $p = 0.000$) and being outside ($b = 1.5$, $p = 0.049$). Play with high speed is positively associated with being outside ($b = 5.5$, $p = 0.000$), and not significantly associated with children's age or gender. R&T play is positively associated with being a boy ($b = 2.2$, $p = 0.007$), negatively associated with being outside ($b = -1.8$, $p = 0.003$), and is not significantly associated with age.

Discussion

The overall aim of this study was to examine the occurrence and characteristics of children's risky play in ECEC in situations where they were free to choose what to play. The first research question aimed at measuring how much of children's time was spent engaging in one of the eight risky play categories during the total time of observations. Observations were made when children were free to choose what to play. Table 2 shows that in the 1878 two-minute observations, 20% of them included registration of one or more of the risky play categories. Nevertheless, in many of the two-minute observations, risky play was not registered for the whole sequence, and children moved between play types. Altogether, risky play constituted 10.3% of children's activity during their time for free play. As mentioned in the introduction, to our knowledge, there is no comparative data on the prevalence of risky play from earlier studies. Former indications of the amount of risky play among children have been founded on the estimations of ECEC practitioners and parents, based on their own experiences, of the proportion of risky play using Likert scales with alternatives such as "once a day or more" (Sandseter 2014) or "never", "seldom", or "often", etc. (Jelleyman et al. 2019). Although there are limited possibilities to compare the finding in the present study to earlier research and to assess if this finding indicates a high or low proportion of risky play, the results show that almost the entire sample of 80 children engaged in risky play at some point. Only four children were registered with no risky play at all. Further, to interpret whether a mean time of 10.3% risky play is proportionally large (or small), it could be indicative to compare with other types of play. From T1 in the same dataset as in the present study, it has been previously published that the three most prevalent play categories were: constructive play, such as building or constructing (30% of observations), functional play, such as physical active play (23%), and symbolic play, such as role playing or dramatic play (12%) (Storli and Sandseter 2019). Compared to the other types of play and the amount of non-play shown in Storli and Sandseter's (2019) analysis, the proportion of risky play is at the same level as symbolic play, a rather common type of play among children.

Table 3 Regression models for risky play, heights, speed and R&T

Model	Risky play	Heights	Speed	R&T
Fixed part	Coeff. (s.d.)	Coeff. (s.d.)	Coeff. (s.d.)	Coeff. (s.d.)
Intercept	-4.6 (3.9)	-4.8 (2.3)	1.7 (2.0)	-1.5 (2.1)
Age	2.6 (0.9)**	2.0 (0.5)***	-0.5 (0.5)	1.0 (0.5)
Boy	2.5 (1.4)	-0.3 (0.8)	0.9 (0.7)	2.2 (0.8)**
Outside	5.7 (1.1)***	1.5 (0.7)*	5.5 (0.6)***	-1.8 (0.6)**
Random part				
Level 1	611 (20)	255 (9)	180 (6)	177 (6)
Variance				
Level 2	15 (7)	2 (2)	3 (2)	6 (2)
Variance				

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

It was also interesting to look at how the eight categories of risky play were distributed within the total amount of risky play in this study. Play with great heights, play with high speed, and R&T play were the most prevalent categories in this study (Table 2). This is in accordance with what Sandseter found in her study of affordances for risky play (Sandseter 2009a). On the other hand, the present study showed very little time spent playing with dangerous tools, with impact, or vicarious risk, and there were no occurrences of play near dangerous elements or play where children go exploring alone. Concerning playing with dangerous tools, a reason for the limited amount could be that this type of play requires specific planning and facilitation by the staff. The sequences where this happened in the present data material were characterized by staff being close to the children, helping them, and instructing them on how to use the tools. This was also the case in Sandseter's (2009b) observations of the characteristics of risky play. For play near dangerous elements or play where children go exploring alone, there is reason to believe that the type of environment included in this study, the fenced-in playground of the ECEC institution, gave little or no affordances for such play. In Sandseter's (2007) categorization of risky play, these were types that typically were observed on hikes to forest areas outside the ECEC playground. The risky play categories play with impact and vicarious risk were originally developed with children under 3 years (Kleppe et al. 2017), and it is an interesting find that these categories occur among older children. In general, prevalence and characteristics of risky play categories should be investigated further, potentially with in-depth, qualitative analysis of characteristics and including younger children.

Another aim of this study was to look at how the frequency of risky play is associated with individuals, gender, age, and the environment (i.e., outdoor/indoor). As mentioned, on the individual level, only four of the children were registered with no risky play at all. Although the average occurrence of risky play for all children was 10.3%, the child with the most risky play was registered with 29.7%. However, only 2% of the variance in risky play is at the child level. The limited variance at the child level indicates that risky play is a universal form of playing that attracts many children. It is also found as an attractive type of play for children in the early years and up to the teenage years (Kleppe et al. 2017; Coster and Gleave 2008; Sandseter 2007). The fact that most children in the present study seemed to engage in some form of risky play during the periods for free play is an essential argument for facilitating risky play in ECEC institutions.

Looking at gender as a variable, the results showed no significant difference between boys and girls (Table 3). Earlier studies have found boys to be more engaged in physically active types of play, such as risky forms of play (Eaton

and Enns 1986; Epstein et al. 2001; Morrongiello and Rennie 1998), while this study did not find a similar gender difference. This result breaks with a stereotypical gender difference and indicates that the play interests of both boys and girls might be broader than expected. When looking at the different types of risky play, the results (Table 3) show that girls spent significantly less mean time in R&T play than boys. Boys being more attracted to R&T play is also documented in previous studies (Blurton Jones 1976; DiPietro 1981; Humphreys and Smith 1984; Smith 2005). This is often argued to be an evolutionary adaptation, among both humans and animals, to enhance fighting skills, and thereby, chances for survival (Sandseter and Kennair 2011; Smith 2005). Regardless of origin, boys' interest in R&T remains persistent, and girls also take part, although in smaller proportions. Facilitation for R&T should, therefore, be taken seriously by the ECEC sector.

The ages included in this study have a span of 3 to 6 years. The multi-level regression analysis (Table 3) estimates that for every year extra year of age, the expected amount of risky play in the observation increases 2.5%. Although this is a relatively limited effect, it does indicate an increasing amount of risky play with increasing age. Moreover, Table 3 shows that age is also positively related to play in great heights, with an estimated increase of 2% in risky play for each year. In this study, age is not related to play with high speed or R&T play. Kleppe et al. (2017) indicate the same trend, that is, children aged 2 and 3 years old engage proportionally more in risky play than 1-year-olds. To our knowledge, no other studies have investigated such associations. Conclusively, there are indications of age relative to engagement in risky play, but the degree to which such associations exist on a broader age span should be explored further.

Concerning the environment in which risky play was registered, the results show that there was, in total, more risky play outdoors compared to indoors and that this difference is statistically significant (Table 2). As shown in both Tables 2 and 3, there are particularly higher amounts of play with high speed outdoors compared to indoors. This could be explained with more affordances for speed such as cycling, sliding, and swinging in the outdoor environment. Also, play in great heights was significantly higher outdoors than indoors and could be explained with more affordances for such play, (e.g., climbing in the outdoor environment). Earlier research on risky play has mainly investigated this as a kind of play that children engage in outdoors (Sandseter 2010b; Little 2010; Brussoni et al. 2015; Greenfield 2003; Smith 1998; Stephenson 2003; Wyver et al. 2010; Sandseter et al. 2019), with the assumption that there is not much risky play in the indoor environment. Nevertheless, Kleppe (2018) found risky play to happen among toddlers both indoors and outdoors. Even though the results in the present study show

that children spent more time engaging in risky play outdoors than indoors, surprisingly, much of children's risky play (7.5%) is registered indoors. This calls for more studies on indoor risky play, what forms it takes, and what features in the indoor environment afford and enable children to engage in risky play. Leaning on these questions, it is interesting to see if there are types of risky play that are more common indoors than outdoors. Looking at Tables 2 and 3, the analysis shows that there is significantly more R&T play indoors compared to outdoors. There is reason to believe that this is because many of the participating ECEC institutions had available indoor tumble spaces, such as areas with soft surfaces, mats, and large construction materials (Sando and Mehus 2019), and children were allowed by the teachers and practitioners to engage in this kind of play.

Limitations

There are limitations to this study. It draws on cross-sectional data that is based on video observations conducted within the children's everyday environment in a Norwegian context where children's risky play in many cases is supported by teachers and practitioners (Little et al. 2012; New et al. 2005; Sandseter et al. 2019). Studies in other cultural contexts with a different perception and practice concerning children's risk-taking could reveal other numbers. Nevertheless, the Norwegian context is suitable for exploring risky play and its natural accordance due to the emphasis on free play generally and outdoor play particularly.

Concluding Remarks

This is the first study, to our knowledge, that sets out to systematically measure the prevalence of risky play in situations where children were free to choose what to play, and to further investigate how the frequency of risky play is associated with individuals, gender, age, and the environment (outdoor/indoor). This study shows that risky play is a common type of play, with a prevalence similar to symbolic play. Both girls and boys engaged to an equal extent in risky play, contrary to earlier suggestions that boys are more attracted to this type of play. Another interesting finding was that even though children engaged more in risky play outdoors than indoors, the amount of risky play indoors was higher than expected. The results of this study show that risky types of play are attractive to children, and that, given the opportunity to choose freely, children engage in this kind of play at the same level as other typical play types such as symbolic play. Implications for this might be the importance of ECEC institutions facilitating possibilities for risky play to provide children, both boys and girls, with physical active play

opportunities, where children are allowed to follow their interests, even though it might look a bit risky to the staff.

There exists very limited research on risky play in indoor environments, and future studies should aim at investigating this further. ECEC institutions should also be encouraged to explore ways of supporting risky play, within a safe context, in their indoor environment. To add to the existing knowledge on how to promote risky play in ECEC, there is also a need for more research on how features in the physical environment can contribute in affording risky play, and how this could differ between age groups, including even younger children than the ones participating in this study. Being aware of the cultural differences of children's opportunities for risky play and how ECEC practitioners perceive and handle children's risk-taking in play, future research should also aim at including comparative approaches between countries, cultures and contexts.

Author Contributions EBHS, Conceptualization, Methodology, Formal analysis, Writing—Original Draft, Project administration; RK, Formal analysis, Investigation, Writing—Original Draft; OJS, Conceptualization, Methodology, Formal analysis, Investigation, Writing—Original Draft.

Funding This work was supported by the Research Council of Norway under Grant 270727.

Compliance with Ethical Standards

Conflict of interest All authors declare that they have no conflict of interest.

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

- Aldis, O. (1975). *Play fighting*. New York: Academic Press.
- Ball, D. J. (2002). *Playgrounds—Risks, benefits and choices* (Vol. 426/2002). London: Health and Safety Executive (HSE) contract research report, Middlesex University.
- Ball, D. J. (2004). Policy issues and risk-benefit trade-offs of "safer surfacing" for children's playgrounds. *Accident Analysis and Prevention*, 36, 661–670.
- Blurton Jones, N. (1976). Rough-and-tumble play among nursery school children. In J. S. Bruner, A. Jolly, & K. Sylva (Eds.),

- Play: It's role in development and evolution* (pp. 352–363). Harmondsworth: Penguin Books.
- Boyessen, M. (1997). *Den truende tryggheten*. Doctoral Thesis, The Norwegian University of Science and Technology Norway, Trondheim.
- Brussoni, M., Gibbons, R., Gray, C., Ishikawa, T., Sandseter, E., Bienenstock, A., et al. (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., 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.
- Bundy, A. C., Lockett, T., Tranter, P. J., Naughton, G. A., Wyver, S. R., Ragen, J., et al. (2009). The risk is that there is "no risk": A simple, innovative intervention to increase children's activity levels. *International Journal of Early Years Education*, 17(1), 33–45.
- Cook, S. C. (1993). *The perception of physical risk by children and the fear/exhilaration response*. Thesis (M.A.), University of Missouri-Columbia, 1993.
- Cook, S. C., Peterson, L., & DiLillo, D. (1999). Fear and exhilaration in response to risk: An extension of a model of injury risk in a real-world context. *Behavior Therapy*, 30, 5–15.
- Coster, D., & Gleave, J. (2008). Give us a go! Children and young people's views on play and risk-taking. Retrieved from https://www.playday.org.uk/wp-content/uploads/2015/11/give_us_a_go_children_and_young_peoples_views_on_play_and_risk_taking.pdf.
- DiPietro, J. A. (1981). Rough-and-tumble play: A function of gender. *Developmental Psychology*, 17, 50–58.
- Eaton, W. O., & Enns, L. R. (1986). Sex differences in human motor activity level. *Psychological Bulletin*, 100, 19–28.
- Epstein, D., Kehily, M., Mac-an-Ghail, M., & Redman, P. (2001). Boys and girls come out to play: Making masculinities and femininities in school. *Men and Masculinities*, 4(1), 158–172.
- Fine, G. A., & Sandstrom, K. L. (1988). *Knowing children: Participant observation with minors (Qualitative research methods; 15)*. Beverly Hills, California: Sage.
- Fjørtoft, I. (2000). *Landscape and playscape. Learning effects from playing in a natural environment on motor development in children*. Doctoral Thesis, Norwegian School of Sport Science, Norway, Oslo
- Freeman, C. (1995). The changing nature of children's environmental experience: The shrinking realm of outdoor play. *International Journal of Environmental Education and Information*, 14(3), 259–280.
- Goldstein, H. (1986). Multilevel mixed linear model analysis using iterative generalized least squares. *Biometrika*, 73(1), 43–56. <https://doi.org/10.1093/biomet/73.1.43>.
- Gray, P. (2011). The decline of play and the rise of psychopathology in children and adolescents. *American Journal of Play*, 3(4), 443–463.
- Greenfield, C. (2003). Outdoor play—The case of risks and challenges in children's learning and development. *Safekids News*, 21, 5.
- Grieg, A., Taylor, J., & MacKay, T. (2007). *Doing research with children* (Vol. 2). London: SAGE.
- Guldberg, H. (2009). *Reclaiming childhood. Freedom and play in an age of fear*. Oxon: Routledge.
- Herrington, S., & Nicholls, J. (2007). Outdoor play spaces in Canada: The safety dance of standards as policy. *Critical Social Policy*, 27(1), 128–138. <https://doi.org/10.1177/0261018307072210>.
- Humphreys, A. P., & Smith, P. K. (1984). Rough-and-tumble in pre-school and playground. In P. K. Smith (Ed.), *Play, In animals and humans* (pp. 241–266). Oxford: Blackwell.
- Jelleyman, C., McPhee, J., Brussoni, M., Bundy, A., & Duncan, S. (2019). A cross-sectional description of parental perceptions and practices related to risky play and independent mobility in children: The New Zealand State of play survey. *International Journal of Environmental Research and Public Health*, 16(2), 262.
- Kemple, K. M., Oh, J., Kenney, E., & Smith-Bonahue, T. (2016). The power of outdoor play and play in natural environments. *Childhood Education*, 92(6), 446–454. <https://doi.org/10.1080/00094056.2016.1251793>.
- Kleppe, R. (2018). *One-to-three-year-olds' risky play in early childhood education and care*. Oslo: Oslo Metropolitan University.
- Kleppe, R., Melhuish, E., & Sandseter, E. B. H. (2017). Identifying and characterizing risky play in the age one-to-three years. *European Early Childhood Education Research Journal*, 25(3), 370–385. <https://doi.org/10.1080/1350293X.2017.1308163>.
- Kyttä, M. (2004). The extent of children's independent mobility and the number of actualized affordances as criteria for child-friendly environments. *Journal of Environmental Psychology*, 24, 179–198.
- Lavrysen, A., Bertrands, E., Leysen, L., Smets, L., Vanderspikken, A., & De Graef, P. (2015). Risky-play at school. Facilitating risk perception and competence in young children. *European Early Childhood Education Research Journal*, 1, 11. <https://doi.org/10.1080/1350293X.2015.1102412>.
- Lester, S., & Maudsley, M. (2006). *Play, naturally. A review of children's natural play*. London: The Children's Play Council.
- Little, H. (2008). Outdoor play. Does avoiding the risks reduce the benefits? *Australian Journal of Early Childhood*, 33(2), 33–40.
- Little, H. (2010). *Young children's physical risk-taking behaviour during outdoor play: The influence of individual, social and environmental factors*. Doctoral thesis, Macquarie University, Sydney.
- Little, H. (2015). Promoting risk-taking and physically challenging play in Australian early childhood settings in a changing regulatory environment. *Journal of Early Childhood Research (online first)*. <https://doi.org/10.1177/1476718X15579743>.
- Little, H., & Eager, D. (2010). Risk, challenge and safety: Implications for play quality and playground design. *European Early Childhood Education Research Journal*, 18(4), 497–513. <https://doi.org/10.1080/1350293X.2010.525949>.
- Little, H., Sandseter, E. B. H., & Wyver, S. (2012). Early childhood teachers' beliefs about children's risky play in Australia and Norway. *Contemporary Issues in Early Childhood*, 13(4), 300–316. <https://doi.org/10.2304/ciec.2012.13.4.300>.
- Little, H., Wyver, S., & Gibson, F. (2011). The influence of play context and adult attitudes on young children's physical risk-taking during outdoor play. *European Early Childhood Education Research Journal*, 19(1), 113–131.
- Morgan, G. A., Gliner, J. A., & Harmon, R. J. (1999). Measurement and descriptive statistics. *Journal of the American Academy of Child & Adolescent Psychiatry*, 38(10), 1313–1315.
- Morrongiello, B. A., & Rennie, H. (1998). Why do boys engage in more risk taking than girls? The role of attributions, beliefs, and risk appraisals. *Journal of Pediatric Psychology*, 23(1), 33–43. <https://doi.org/10.1093/jpepsy/23.1.33>.
- Moser, T., & Martinsen, M. T. (2010). The outdoor environment in Norwegian kindergartens as pedagogical space for toddlers' play, learning and development. *European Early Childhood Education Research Journal*, 18(4), 457–471. <https://doi.org/10.1080/1350293X.2010.525931>.
- Moss, S. (2012). *Natural childhood*. Rotherham: National Trust.

- New, R. S., Mardell, B., & Robinson, D. (2005). Early childhood education as risky business: Going beyond what's "safe" to discovering what's possible. *Early Childhood Research and Practice*, 7(2), 2.
- NMER (2017). Framework Plan for the Kindergartens. Retrieved 14 June 2018 from <https://www.udir.no/globalassets/filer/barnehage/rammeplan/framework-plan-for-kindergartens2-2017.pdf>.
- Sando, O. J., & Mehus, I. (2019). Supportive indoor environments for functional play in ECEC institutions: A strategy for promoting well-being and physical activity? *Early Child Development and Care*. <https://doi.org/10.1080/03004430.2019.1651305>.
- Sandseter, E. B. H. (2007). Categorizing risky play—How can we identify risk-taking in children's play? *European Early Childhood Education Research Journal*, 15(2), 237–252.
- Sandseter, E. B. H. (2009a). Affordances for risky play in preschool: The importance of features in the play environment. *Early Childhood Education Journal*, 36(5), 439–446.
- Sandseter, E. B. H. (2009b). Characteristics of risky play. *Journal of Adventure Education and Outdoor Learning*, 9(1), 3–21. <https://doi.org/10.1080/14729670802702762>.
- Sandseter, E. B. H. (2010a). 'it tickles in my tummy!': Understanding children's risk-taking in play through reversal theory. *Journal of Early Childhood Research*, 8(1), 67–88. <https://doi.org/10.1177/1476718x09345393>.
- Sandseter, E. B. H. (2010b). *Scaryfunny: A qualitative study of risky play among preschool children*. Trondheim: Norwegian University of Science and Technology.
- Sandseter, E. B. H. (2012). Restrictive safety or unsafe freedom? Norwegian ECEC practitioners' perceptions and practices concerning children's risky play. *Childcare in Practice*, 18(1), 83–101.
- Sandseter, E. B. H. (2014). Early childhood education and care practitioners' perceptions of children's risky play; Examining the influence of personality and gender. *Early Child Development and Care*, 184(3), 434–449. <https://doi.org/10.1080/03004430.2013.794797>.
- Sandseter, E. B. H., Cordovil, R., Hagen, T. L., & Lopes, F. (2019). Barriers for outdoor play in early childhood education and care (ECEC) institutions: Perception of risk in children's play among European parents and ECEC practitioners. *Child Care in Practice*, 26(2), 111–129. <https://doi.org/10.1080/13575279.2019.1685461>.
- Sandseter, E. B. H., & Kennair, L. E. O. (2011). Children's risky play from an evolutionary perspective: The anti-phobic effects of thrilling experiences. *Evolutionary Psychology*, 9(2), 257–284.
- Sandseter, E. B. H., & Kleppe, R. (2019). Outdoor Risky Play. In R. E. Tremblay, M. Boivin, R. Peters, & M. Brussoni (Eds.), *Encyclopedia on Early Childhood Development* [online] Retrieved 15 Mar 2020 from <https://www.child-encyclopedia.com/outdoor-play/according-experts/outdoor-risky-play>: Published May 2019.
- Sandseter, E. B. H., Little, H., & Wyver, S. (2012). Does theory and pedagogy have an impact on provisions for outdoor learning? A comparison of approaches in Australia and Norway. *Journal of Adventure Education and Outdoor Learning*, 12(3), 167–182. <https://doi.org/10.1080/14729679.2012.699800>.
- Smith, P. K. (2005). Play. Types and functions in human development. In B. J. Ellis & D. F. Bjorklund (Eds.), *Origins of the social mind. Evolutionary psychology and child development* (pp. 271–291). New York: The Guilford Press.
- Smith, S. J. (1998). *Risk and our pedagogical relation to children: On playground and beyond*. New York: State University of New York Press.
- Spiegel, B., Gill, T. R., Harbottle, H., & Ball, D. J. (2014). *Children's play space and safety management* (Vol. 4, Rethinking the Role of Play Equipment Standards, Vol. 1).
- Stephenson, A. (2003). Physical risk-taking: Dangerous or endangered? *Early Years*, 23(1), 35–43. <https://doi.org/10.1080/095751403200045573>.
- Storli, R., & Sandseter, E. B. H. (2019). Children's play, well-being and involvement: how children play indoors and outdoors in Norwegian early childhood education and care institutions. *International Journal of Play*, 8(1), 65–78. <https://doi.org/10.1080/21594937.2019.1580338>.
- UN (2013). General comment No. 17 on the right of the child to rest, leisure, play, recreational activities, cultural life and the arts (art. 31) Convention of the Rights of the Child. Geneva: United Nations Committee on the Rights of the Child.
- Utdanningsdirektoratet (2012). *Angående arealnormen i barnehager*. Oslo: Utdanningsdirektoratet
- Watchman, T., & Spencer-Cavaliere, N. (2017). Times have changed: Parent perspectives on children's free play and sport. *Psychology of Sport and Exercise*, 32, 102–112. <https://doi.org/10.1016/j.psychsport.2017.06.008>.
- Waters, J., & Begley, S. (2007). Supporting the development of risk-taking behaviours in early years: An exploratory study. *Education*, 35(4), 365–277.
- Watson, B., Shaw, B., & Hillman, M. (2013). A comparison study of children's independent mobility in England and Australia AU—Carver Alison. *Children's Geographies*, 11(4), 461–475. <https://doi.org/10.1080/14733285.2013.812303>.
- Wyver, S., Bundy, A., Naughton, G., Tranter, P., Sandseter, E. B. H., & Ragan, J. (2010). Safe outdoor play for young children: Paradoxes and consequences. In S. Howard (eds), *Proceedings of the AARE International Education Research Conference: AARE*.
- Zimmerman, P. H., Bolhuis, J. E., Willemsen, A., Meyer, E. S., & Noldus, L. P. (2009). The observer XT: A tool for the integration and synchronization of multimodal signals. *Behavior Research Methods*, 41(3), 731–735. <https://doi.org/10.3758/brm.41.3.731>.

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