International Journal of Early Childhood Environmental Education

ISSN: 2331-0464 (online)

How Cold is Too Cold? A Descriptive Study of Cold-Weather Play in Minnesota's Nature-Based Early Learning Programs

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Submitted July 9, 2025; Accepted December 16, 2025

ABSTRACT

While young children generally enjoy outside playtime regardless of the weather (Bilton, 2010), inclement weather often surfaces as a barrier to outdoor play among early childhood educators (McClintic & Petty, 2015). Considering declining outdoor playtime in childcare centers (Copeland et al., 2016) and significant declines in childcare-related outdoor playtime in northern latitudes across seasonal changes (Merrill et al., 2005; Schuna et al., 2016), a descriptive study of cold-weather outdoor play was conducted of 39 Minnesotan (United States) nature-based early learning programs. Since perceptions regarding the difficulty and safety of outdoor play provision are predictive of the implementation of outdoor play (Chakravarthi, Hatfield, & Hestenes, 2009), this study documented weekly outdoor playtime in winter months, strategies used to keep children safe in sub-zero temperatures, and perceived benefits of cold-weather play. This study can inform efforts to help reduce cold-weather safety concerns among other decision-makers, such as administrators and lawmakers, particularly in the context of advocating for early childhood regulatory and licensure language that supports outdoor learning for all children.

***Keywords*:** cold weather, winter, outdoor play, nature play

Early learning and care programs are an integral part of childhood, a place where children are introduced to societal norms and values and have foundational experiences, with lasting impacts on their short- and long-term development (Erdem, 2018; Sando, 2019). Most children in the United States (U.S.) ages three to five spend 30 or more hours per week at preschool (Tandon et al., 2013). In Minnesota, about 76% of children receive some form of non-parental care, and about 48% of children attend preschool (Chmielewski, 2025). Since children spend much of their waking hours in a childcare or preschool setting, these programs are consequently where children have the largest opportunity to play outside.

The importance of outdoor free play in early childhood is well-established in the research literature, with benefits across developmental domains (McCurdy et al., 2010). Not only do outdoor spaces further learning and development in different ways than inside (American Academy of Pediatrics et al., 2019), outdoor play spaces have also been associated with increased moderate-to-vigorous physical activity (MVPA), with MVPA levels doubling when children play outdoors versus indoors (Martin et al., 2022). According to the Minnesota Department of Health (2022), young children should have at least 60 minutes of structured physical activity, 60 minutes of unstructured physical activity per day, and not be sedentary for more than 60 minutes at a time, except when sleeping. The World Health Organization also supports the recommendation of more than 60 minutes daily of moderate-to-vigorous physical activity (Danielsen et al., 2021). Facilitating physical activity in early childhood is especially important, as it helps build a mindset of enjoying movement with lasting health impacts far beyond the preschool years (Hesketh et al., 2017; Ylvisåker et al., 2022).

Outdoor play in nature-based settings appears to be particularly beneficial, as natural settings afford improvements in the amount and quality of young children's play, offering opportunities for more self-directed, complex play and play that involves risk-taking (Jost et al., 2024). Research also suggests that outdoor play in nature furthers more imaginative and cooperative play, increasing play quality overall (Jost et al., 2024; Smedsrud et al., 2024). The systematic review of nature play benefits by Dankiw et al. (2023) suggests not only wide-ranging health benefits, such as immune health, physical activity, gross and fine motor development, sleep quality, and mental health and well-being but also a range of social-emotional and cognitive impacts. Additionally, Vitamin D is produced through sun exposure while playing outside, which is especially important in the cold weather months with fewer daylight hours (American Academy of Pediatrics et al., 2019).

In addition to the benefits of outdoor play in general, Rooney (2018) suggests there are unique benefits associated with seasonal outdoor play. Utilizing the term "weather worlding," Rooney (2018) states how outdoor experiences cannot be separated from the weather:

> We know what it is like to be in the open on a windy day… We also know how the rain feels as it trickles down our face and the smell in the air as a storm approaches. The heat of the midday sun can warm the skin and if we trudge too long through the winter snow our toes may go numb or ache with pain. These, and many such other experiences, are familiar weather encounters..., children often experiment with their own part in the weather world. On cold days the simple act of breathing out can become visible through condensation forming in the air that is exhaled, and it is not uncommon to witness an excited exclamation from children keen to share the connection between their own breathing, the elemental conditions and their own 'becoming weather.' Understood in this way, there is no clear boundary between the human body and the elements" (p. 5-6).

Consequently, children are constructing meaning of the world around them – as active participants – just by being outside. Therefore, play experiences outdoors are never "weather-neutral," as how we remember and experience a specific time or place is impacted by the weather (Rooney, 2018, p. 7). The weather-human relationship is built upon sensory and affective interactions experienced outdoors. Although the weather is "not always easy or comfortable," it helps us understand the "co-mingling of human/weather relations" (Rooney, 2018, p. 9). If given space and time, children can utilize their sense of wonder to explore their understanding of the interconnection between the world, its living creatures, and the weather.

Despite the benefits, children in early learning and care environments generally spend little time in outdoor play (Trost et al., 2010). Further, many children do not get the recommended amount of daily physical activity, living more sedentary daily lives (Copeland et al., 2011; Hesketh et al., 2017; Ylvisåker et al., 2022). One study suggests children in childcare spend almost half of their time in sedentary indoor activities (Ellis et al., 2017). Additionally, research indicates that in many childcare centers, outdoor playtime is occurring less frequently than scheduled, with over 80% of centers studied scheduling an hour or more of outdoor time, but only about a quarter of them actually providing it to children (Copeland et al., 2016). In that same study, about a third of young children experienced no outdoor playtime whatsoever (Copeland et al., 2016).

While young children generally like to play outside regardless of the weather (Bilton, 2002), inclement weather often surfaces as a barrier to outdoor play among early childhood educators (Ernst, 2012; Ernst, 2014; McClintic & Petty, 2015). In northern latitudes, a decline often occurs in childcare-related outdoor playtime across seasonal changes, with seasonal playtime variation attributed to temperature, precipitation, and daylight hours (Merrill et al., 2005; Berkey et al., 2003; Schuna et al., 2016). In Turkey, for example, preschool teachers reported that they used the outdoors most often in the spring and only seldom or never in the winter (Erdem, 2018). Kandemir & Sevimli-Celik (2023) similarly reported a decline in outdoor play in early childhood programs during the colder months, with both teacher and parent restrictions due to cold and/or rain.

Barriers to cold-weather outdoor play include teachers' preferences to stay inside in inclement weather (Elliot, 2021; Hughes et al., 2017), lack of outdoor clothing/gear (Copeland et al., 2009), and time involved in cold-weather dressing routines (Hatcher & Squibb, 2010). Haakenstad et al. (2023) concluded through focus group interviews and surveys that outdoor gear barriers could be summarized as a financial and time burden on parents, with barrier strength inversely associated with socio-economic status. Quality outdoor gear can be expensive, gear needs to be cleaned and dried often, and young children quickly outgrow clothing. Additionally, parents can be rushed in the morning and may not have enough time to collect the appropriate gear (Jayasuriya et al., 2016). However, classes can be limited to going outside if even just one child is not appropriately dressed. In addition to gear and its time and monetary associations, the physical play materials and the outdoor play spaces can be a barrier to cold-weather outdoor play. Having a range of durable materials – such as skis, snow shovels, toboggans, plastic bins, snowshoes, and other loose parts – helps facilitate engagement with the outdoors, in addition to building upon children's interests (Jacobs et al., 2019; Kracht et al., 2024; Scheffel et al., 2021). However, similar to outdoor clothing, equipment needed for winter sports is often expensive and associated with racial and/or socio-economic privilege (Haakenstad et al., 2023). Outdoor play spaces themselves may need modifications, such as wind buffers, which also require monetary and time investments (Dankiw et al., 2023). Furthermore, outdoor play spaces in colder weather may result in indoor messes, such as dirty snow melting on the floor in the entryway, requiring more time for cleaning after outdoor play.

Another barrier to cold-weather play is safety concerns. In early learning and care settings, fear of injuries and litigation can lead to a tension between valuing outdoor play and the practice of cold-weather outdoor play, as some educators perceive cold-weather play as risky (Jayasuriya et al., 2016). Parental safety concerns also impact outdoor play (Erdem, 2018; Kandemir & Sevimli-Celik, 2023) and cold-weather outdoor play in childcare and elementary school settings (Jacobs et al., 2019). Even if only one or a few of the parents oppose having their children play outdoors in cold weather, challenges result for childcare staff, and outdoor play opportunities are diminished for the class as a whole (Jayasuriya et al., 2016). Furthermore, how children are perceived can also be a barrier to cold-weather play, as children are often viewed as an object that needs protection. For example, Hesketh et al. (2017) found that extreme weather was frequently mentioned in the context of child safety, with "a general preoccupation with ensuring children were protected, usually at the expense of being physically active" (p. 1012).

As misleading cold-weather preconceptions (such as children will catch a cold if they go out in the cold) can limit cold-weather outdoor play opportunities, children's vulnerability to extreme temperatures is important to acknowledge. For example, exposure to cold temperatures can exacerbate childhood asthma symptoms and produce shortness of breath (Rasi et al., 2017), as well as place children at risk for frostbite to their extremities, such as noses, ears, fingers, and toes (Cappaert et al., 2008). Additionally, as pointed out by Rasi et al. (2017), children who are more susceptible to frostbite, more prone to lower temperatures in extremities, with neurological disorders, and immigrant children whose families are not accustomed to cold weather are particularly vulnerable. Despite these concerns, the researchers suggested that cold weather should not be an obstacle to children's unstructured outdoor play, given its wide range of positive effects on children's mental and physical well-being. Instead, Rasi et al. (2017) advocate for supporting children's outdoor activities in winter, while being mindful of the cold-related risks and taking prevention strategies, such as shortened duration of cold exposure.

While day-to-day activities vary due to individual program characteristics and goals, outdoor play is considered among best practices in early childhood learning and care programs (Bjørgen, 2015). Yet, policy research on state-funded preschool programs indicates that only 42% of states require outdoor play, with an additional 17% of states providing guidance, but not requirements, for outdoor time (Jost et al., 2024). For states that did have regulations or guidance on outdoor playtime, over half (52%) did not specify the amount of outdoor time required. States specifying the amount of time ranged from suggesting or requiring up to 60 minutes daily, with 17% suggesting or requiring multiple daily opportunities for outdoor play (Jost et al., 2024). Regarding weather conditions, about half (48%) had regulations or guidance on weather-related restrictions for outdoor play. State-level policies and guidance, as well as licensing regulations and quality rating and improvement systems for center-based and family childcare programs, have the

> potential to increase or limit young children's outdoor and nature-based experiences… State policies may set minimums for outdoor time or impose weather-based restrictions on outdoor time, set requirements for outdoor spaces, including nature-based experiences and environmental education, and set expectations, standards, or requirements for outdoor play. These rules could facilitate outdoor time for young children, but could also unintentionally obstruct access (Jost et al., 2024, p. 6).

Minnesota is located in the northern U.S., and its climate is characterized by four seasons, including cold winter weather. Currently, licensed childcare centers in Minnesota have no guidelines restricting cold-weather outdoor play, so the inclusion and duration of outdoor play across seasons are decided upon by individual programs. However, state legislation has proposed to restrict outdoor play at "real feel" temperatures of -15°F or colder (Minnesota Department of Human Services, 2025). Since cold winter weather in Minnesota may occur for up to half of the academic school year, this legislation has the potential to severely inhibit how often children can play outdoors and access natural outdoor learning environments. As such, a descriptive study was conducted among nature-based early learning programs in Minnesota to document weekly outdoor playtime in winter months, alongside strategies being used to keep children safe in sub-zero temperatures and the perceived benefits of cold-weather play. This study can inform efforts to help reduce cold-weather safety concerns among decision-makers, such as program administrators and lawmakers, particularly in the context of advocating for regulatory and licensure language that supports outdoor learning for all children.

METHODOLOGY

An invitation to participate in the study was sent to the approximately 100 programs in the Minnesota Early Childhood Outdoors (MNECO) network. MNECO is a grassroots network of Minnesota providers that share the aim of providing nature-based experiences for young children. This network includes family childcare providers, childcare centers, and public and private preschools. While these programs are all referred to as nature-based programs in this study, due to their affiliation with MNECO, they implement nature-based early learning to varying degrees. In light of the study context, the focus was on unstructured outdoor play, as opposed to specifically nature play or nature-based learning, with the reasoning that if outdoor play is restricted by low-temperature thresholds, nature-based outdoor learning will be restricted as well.

Thirty-nine practitioners responded to the invitation. Of these 39 practitioners, 22 self-identified their programs as nature preschools (many of which were licensed as family or center-based childcare centers); the remaining were center-based childcare providers (6), family childcare providers (5), preschool or kindergarten programs affiliated with a public school (5), and a private preschool (1). Additional demographic data on the practitioners or programs were not collected. The University's Institutional Review Board reviewed the study and determined that it did not meet the definition of research with human subjects. As such, there was no formal informed consent process; however, participants received an explanation of the study and its voluntary nature. Participants received $75 in appreciation for their time and effort.

Over nine weeks in December 2024 - February 2025, participating practitioners received an electronic reporting log (Google Form) each Friday. Programs did not receive the reporting log over the two weeks of winter break. The reporting log was modified with permission from an instrument used by the Colorado Collective for Nature-Based Early Education to document cold-weather play in support of outdoor preschool licensing efforts. In the study at hand, the reporting form asked practitioners to report the lowest temperature of the past week during hours of program operation, as well as the total number of minutes children went outside on the day of the reported lowest temperature and what strategies, if applicable, were used to support cold-weather play on that day of the reported low. Additionally, practitioners were asked to report any cold-weather-related injuries or safety incidents that were brought to the attention of the parent/guardian, and whether there were parent concerns or complaints related to the cold-weather play that week.

The final reporting log contained additional questions, including whether they have a "too cold" temperature threshold for cold-weather play, as well as other considerations beyond temperature that factor into their decision-

making around cold-weather play. This final reporting log also asked what shaped their receptivity and ability to manage cold-weather play and their perceptions of the benefits of cold-weather play. Practitioners also had an opportunity to respond to a prompt regarding what they would like policymakers to know regarding cold-weather outdoor play.

After the nine-week data collection period had concluded, data analysis was conducted. Descriptive statistics were used to analyze the quantitative data. Data from the open-ended items were summarized inductively (Braun & Clarke, 2006), looking for common strands, patterns, themes, and categories in the participants' responses. Because of the exploratory, descriptive nature of this study, the reporting log/questionnaire items served as general guides for categorizing and reporting the data.

RESULTS

Provision of Cold Weather Play

Throughout the nine weeks of data collection, participating programs were asked to report the lowest temperature of the past week during hours of program operation, as well as the total number of minutes children went outside on the day of the reported lowest temperature. In the table below, the first column represents the weekly low temperature during program operation. The next three columns represent the amount of outdoor playtime for programs that experienced this temperature during the week. Because practitioners were given the option to report actual or "real feel" temperatures, the data is broken down accordingly into the two subsections of the table. Additionally, since Minnesota has a breadth of latitude, not all programs throughout the state experienced the same low temperature at the same time. This data suggests that programs are providing outdoor playtime at temperatures well below the proposed "too-cold" threshold of -15°F ("real feel"). Even on days with reported "real feel" temperatures as cold as -39°F, most programs are providing time outdoors.

Table 1
Provision of Outdoor Play by Lowest Weekly Temperature Experienced

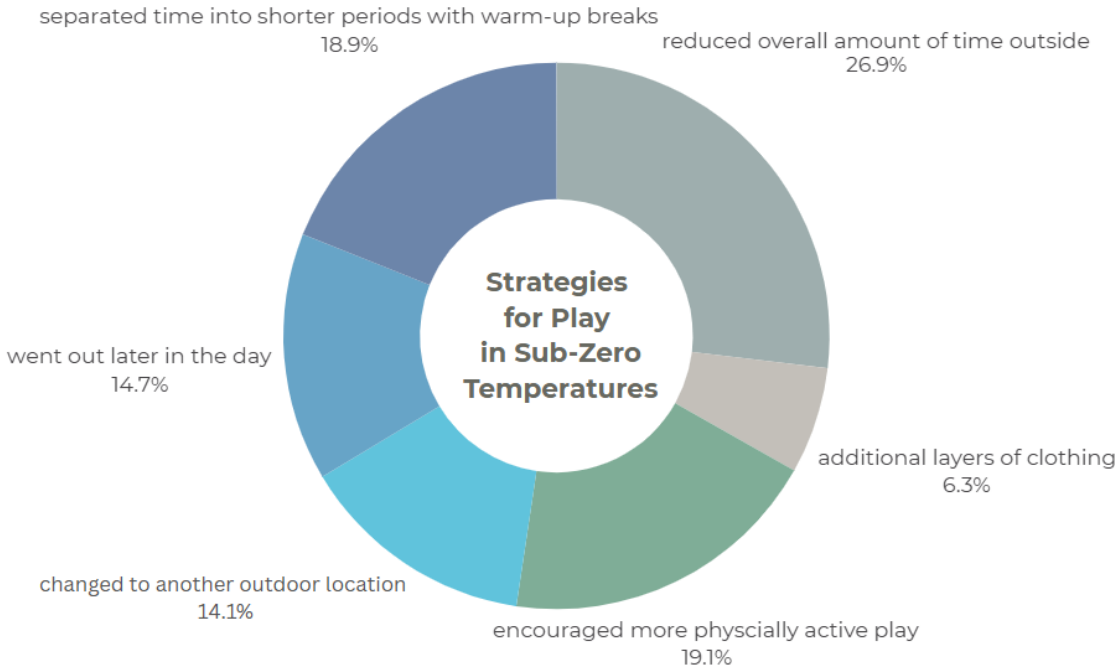
Temperature (°F)	% of Programs Experiencing this Temperature as Their Weekly Low that Provided Outdoor Play on that Day	Most Frequently Reported Amount of Outdoor Playtime on Day of Reported Low	Highest Reported Amount of Playtime Outdoors on Day of Reported Low
Real Feel			
≥ 31	100%	2-4 hrs	> 4 hrs
21 to 30	100%	2-4 hrs	> 4 hrs
11 to 20	100%	2-4 hrs	2-4 hrs
1 to 10	100%	2-4 hrs	> 4 hrs
-9 to 0	100%	2-4 hrs	2-4 hrs
-19 to -10	85%	30 min	2-4 hrs
-29 to -20	89%	30 min	2-4 hrs
-39 to -30	93%	30 min	2-4 hrs
≤ -40	25%	0 min	2-4 hrs
Actual			
≥ 31	00%	2-4 hrs	2-4 hrs
21 to 30	00%	2-4 hrs	> 4 hrs
11 to 20	00%	2-4 hrs	> 4 hrs
1 to 10	3%	30 min	> 4 hrs

-9 to 0	8%	60 min	> 4 hrs
-19 to -10	3%	30 min	> 4 hrs
-29 to -20	3%	0 min	90 min
-39 to -30	%	0 min	0 min

Practitioners reported using a variety of strategies to support cold-weather play on the day of the reported weekly low temperature. The most common strategies used included reducing the total amount of time outside, encouraging more physically active play, and breaking up the typical amount of outside time into shorter time periods with warm-up breaks in between. Additional strategies included bringing children out later in the day when the sun was higher in the sky, playing in a location sheltered from the wind, and using additional layers of clothing, protective equipment, or supplemental heat sources (such as neck gaiters, ski goggles, hand and toe warmers, etc.). Figure 1 illustrates the relative frequencies of these strategies.

Figure 1

Relative Frequencies of Strategies Used by Practitioners to Support Cold-Weather Play on Days of Reported Weekly Low Temperatures.



Cold-Weather Play Safety and Parental Satisfaction

Across the nine weeks (45 days) of data collection and the approximately 895 children collectively in the care of the participating providers, six minor injuries from cold weather were brought to parents' attention. Of those, five were frostnip, and one was a child who had their lip stuck to a metal surface. No cold-weather play injuries during this period needed medical attention. During this same period, practitioners collectively had six indications of parental dissatisfaction toward cold-weather outdoor playtime. Of these six indications, three were minor parent complaints, two were parents sending their children for only the indoor portion of the day, and one was a parent not wanting to have their child go out due to an illness.

"Too-Cold" Temperature Thresholds

Minnesota currently does not have a temperature threshold where cold-weather play is restricted, so the inclusion and duration of outdoor play across seasons are decided upon by individual programs. Eleven of the 39 practitioners indicated using "too cold" temperatures to guide decision-making relating to cold-weather play, with real-feel temperature thresholds ranging from 0°F to -20°F, often guided by local school district policies. Two practitioners indicated using a threshold of whatever temperature and wind chill combination would result in frostbite in under 10 minutes, signaled by NOAA's Wind Chill Chart. For practitioners not using "too-cold" temperature thresholds, many suggested that temperatures were more useful for guiding how to dress and where to play, as opposed to determining whether to go outside to play.

Beyond temperature, practitioners indicated taking other factors into account in their decision-making regarding outdoor play in sub-zero temperatures, such as the following:

- The specific children in their care (ages, presence and quality of gear; ability to keep gear on and skin covered; general health and wellness; acclimation based on newness to program and/or winter; energy and activity level; coordination levels and gross motor skills; sensory needs and sensitivities; and the needs of children on that particular day);
- Teachers and supporting staff (regular staff vs. substitute teachers; ability to assess risk and monitor children for signs of cold-weather injuries; the staff's own health and/or needs; and the overall child-staff ratio);
- Wind (direction, speed, and gusts; availability of places to play out of the wind or find shelter; and the presence of standing dead trees or potential for falling branches);
- Sun (cloud cover and how high the sun is in the sky);
- Presence of ice or snow at a depth that would limit physical activity levels;
- Humidity (presence or absence of high humidity levels that would trap moisture and make children feel colder); and
- Environmental conditions that increase the possibility of becoming wet and cold.

Influences on Providers' Abilities to Support Cold-Weather Play

Practitioners' abilities to safely support cold-weather play appear to be primarily supported and strengthened through community networks. In particular, practitioners indicated listening to, observing, and learning from experienced colleagues and programs. Additionally, many indicated drawing from local, state-level, or national outdoor and environmental education networks, as well as social media, for knowledge-sharing and problem-solving. Some practitioners also indicated furthering their learning through online resources, books, and research, as well as wilderness first aid classes or self-study to prevent cold-weather-related injuries. Further avenues included student-teaching at programs or in countries where cold-weather play is the norm and drawing upon their childhood experiences of playing outside in all seasons and weather. Additionally, some practitioners suggested the shift to outdoor learning prompted by COVID-19 provided an opportunity to grow their abilities and confidence, while helping them recognize high capability levels in both themselves and their children. Many suggested a process of gradual learning, starting with "small steps" and progressively building to cold-weather play of longer periods and in colder temperatures.

Benefits

Practitioners articulated many perceived benefits from cold-weather outdoor play. A common theme among practitioners was that cold-weather play also affords unique opportunities for learning and development and that these skills would not develop as prominently if play were confined indoors during the winter months. As one practitioner stated, "Winter is when we see the most growth. Adversity, physical challenges (walking in snow, sliding, sledding, skiing), and confidence lead to development. We see huge leaps in capabilities!" The following are cold-weather play benefits identified by practitioners:

- *Physical health and development:* general robustness and hardiness; fewer illnesses; increased physical activity through big body play; improved motor skills, coordination, and balance; increased strength and stamina; improved proprioceptive senses; activation of brown adipose tissue ("brown fat"); and improved cold tolerance;
- *Mental well-being:* boosts mood; reinvigorates; and exhilarates;
- *Emotional and behavioral regulation:* movement in snow provides natural "heavy work" that helps children calm their bodies; less challenging and unwanted behaviors; and increased positive interactions among children with sensory needs;
- *Curiosity and creativity:* inquisitiveness and wonderment are prompted by winter's gifts of snow, ice, and cold temperatures; and creative thinking naturally emerges from the "loose parts" of ice and snow;
- *Attentiveness:* noticing and attending to the different aspects of the winter environment, such as different sounds and textures of snow, changes in comfort level based on weather conditions and amount of activity, tradeoffs between finger dexterity and warmth, and ease of pulling sleds on ice compared to deep snow;
- *Persistence and resilience:* building grit from physically demanding play and movement; and fostering resilience through planning for and regularly being out in challenging environmental conditions;
- *Self-Confidence:* feelings of pride and joy from not being limited by the weather; mastery, competency, and independence regarding outdoor dressing routines; confidence from accomplishing challenging tasks (climbing mountains of snow, learning how to snowshoe, and being outside and staying warm in very cold temperatures);
- *Social Understandings:* a sense of community as children verbalize their needs and rely on those around them; cooperation to ensure all stay warm; consideration of the group as a whole; respectfulness of one another's needs; opportunities to feel seen and protected as peers watch out for exposed skin; and opportunities for gratitude and appreciation (for the sun's warmth, cozy fires, and peers who help);
- *Connection to Nature:* feeling more intertwined with nature when out in the winter with only wildlife and trees around; a greater appreciation for how wildlife survives in the winter; a deepened sense of place from experiencing all seasons; hearing the quiet of falling snow; and seeing the "moods of nature;"
- *Self-Management and Risk-Management:* listening to body signals to stay safe in the cold; noticing what helps to feel warm; learning what happens when gear gets wet; education about tree and ice safety; and assessing traction on slippery surfaces;
- *Early Academics:* learning science concepts (wildlife adaptations, population dynamics, the water cycle, phases of matter, weather, and friction); science process skills (predictions, hypotheses, experiments, and problem-solving); reading thermometers; positive and negative numbers; and geometric designs; and
- *Rippling influences outward to families:* as children experience cold-weather play in a safe, enjoyable, and ongoing way, their enjoyment and capabilities often extend outward to their families, consequently increasing their families' interest in going outside during the winter months.

Insights for Policy- and Decision-Makers

In response to the open-ended question on the final reporting log that allowed practitioners to convey what they would like policymakers and other decision-makers to know about cold-weather play with young children, practitioners had many useful insights. The following themes emerged from the responses, illustrated by verbatim quotations from the practitioners to capture the richness of their insights:

- Practitioners' motivations for and implementation of cold-weather play have children's best interests in mind.

Outdoor play is beneficial for motor development and academic development; the temperature doesn't dictate how imperative being outside is to children. I feel very comfortable with cold-weather play because I feel confident I can keep children safe while also creating meaningful learning opportunities that would not happen if we stayed inside.

People who know how to teach outdoors offer children one of the richest learning environments possible. Also, after a few years of minimal winter, I think we are experiencing something precious and fleeting. Let children have memories of snow and ice as climate change warms our winters.

We can do this safely and have been for years! We love these children and would never put them at risk. It is GOOD for children and GOOD for staff.

- Children become acclimated to cold weather and respond favorably to outdoor play in sub-zero temperatures.

  On the coldest day of the winter, children were heard telling one another at the end of the day that it was 'the funnest day ever!'

- Cold-weather play is good for teachers, as well as children.

  It's good for grown-ups to go outside every day. I sleep better than most of my friends, and I feel it's because I'm out every day. It breaks the day up, too. I sometimes feel secluded working alone, and when I'm out of the house, it just seems like I'm getting some away time from my home/work.

  Living in Minnesota, we deal with cold weather a lot. I personally find that I am happier if I prioritize time outside, even in cold weather, and feel like that is true for children as well. It keeps up my physical and mental energy.

- Motivation for cold-weather play is grounded in seeing the unique benefits and recognizing the meaningful learning opportunities that would not happen indoors. Practitioners appreciate the seasonality of Minnesota and a desire for the children in their care to grow their capabilities for outdoor activity in all seasons, not just in "nice weather."

  Cold-weather play is a part of being in Minnesota! The research on the benefits is abundant and makes it clear that we can't NOT provide children with these opportunities.

  Children have been playing outside in the cold long before now. Helping children embrace the cold at a young age teaches them how to be safe in different weather conditions and helps them build self-awareness. They can feel more deeply connected to the environment and their community as they brave the cold with one another.

  We live in Minnesota. We can't fear the cold. It's not going to help these kids become reasonable and capable adults. If too much emphasis is placed on protecting children from the potential risks of cold-weather play, this "protection" comes at a detriment, hindering the lifelong cold-weather education and experiential knowledge that will actually protect children.

  Minnesota is a wonderful, beautiful place. We are not victims of its temperature extremes, and it's our responsibility to learn how to manage our clothing choices and our bodies in the elements so we can enjoy its beauty year-round.

- A "too cold" temperature guidepost may falsely imply safe conditions to providers less experienced with cold-weather play, as the combination of environmental conditions and child-

related factors may lead to unsafe conditions even in less extreme cold temperatures. Flexibility in licensing requirements regarding cold-weather play is necessary.

Every program is different from what they/families can afford to dress the children in, the location of the program (not just that it's colder up north, but some have sunnier locations and others have locations that can break the wind), and some programs have multiple adults to help, and others have one adult doing it on their own. Each program has its own set of children with various skills and abilities. We shouldn't make laws on something with so many variables. Instead of a new regulation, education to support safe cold-weather play would be more helpful.

A set number on the thermometer does not factor in the type of environment a school has, children's gear, and the physical and mental benefits of being outdoors. Providers should be able to set their own parameters, as there are strategies we can use to adjust to the elements and enjoy Minnesota. We need to teach children to dress warmly and move outside. We can't keep raising kids to fear the cold and stay inside and be inactive for months on end.

DISCUSSION AND IMPLICATIONS

Before discussing these findings, it is helpful to situate them within the limitations of our methods. First, the study utilized a self-report method and intentionally had a relatively small, purposefully homogeneous sample of 39 respondents (practitioners who valued and provided opportunities for nature-based outdoor play in cold weather). Thus, this sample is not representative of the landscape of early learning and care programs and practitioners in Minnesota. Additionally, the benefits of cold-weather play indicated here are perceived benefits, not empirically collected outcomes or impacts. While these participants are closest to the work at hand and thus a credible and ecologically valid source of information, a potential remains for social desirability bias and less of a likelihood to bring forward "negative" information. In spite of these limitations, and without making claims of generalizability, what is presented here are data and insights from practitioners that may be helpful to decision-makers, such as administrators and lawmakers, particularly in the context of regulatory and licensure language regarding outdoor learning and weather conditions.

Unstructured outdoor play across seasons and weather conditions has many benefits for young children, evidenced in the research literature, and recognized and valued by practitioners, which help offset the time and effort involved in taking young children outdoors in cold weather. When considering the feasibility of cold-weather play, safety concerns are a prime driver of decision-making. While there are risks to cold-weather play, such as decreased core temperature (hypothermia) and freezing injuries (frostnip and frostbite), risks are also associated with limiting physical activity during the winter months, which can be a significant proportion of the year. Additionally, with early childhood education and care facilities often lacking sufficient room inside for big-body play and movement, outdoor physical activity in winter is particularly important. As one practitioner aptly summarized, "There is lots of good research on risky play and the benefits, such as fewer injuries, not to mention the mental health benefits of children and adults who are not fearful of being outdoors in all weather, but instead embrace it and the many wonderful things Minnesota winters have to offer!"

This study suggests that Minnesota nature-based early learning and care practitioners are self-imposing a high level of attention to decision-making and practices, and that decisions about cold-weather play are more nuanced than a single "too cold" temperature. Through the use of strategies such as reducing the total amount of time outside, encouraging more physically active play, and breaking up the typical amount of outside time into shorter periods with warm-up breaks in between, practitioners are bringing young children outdoors despite very cold temperatures that occur during program hours. Even on days with reported "real feel" temperatures as cold as -39°F, most programs are providing time outdoors.

Results of this study further suggest that this approach of practitioners' nuanced decision-making, versus reliance solely on a "too-cold" temperature threshold, and drawing on a variety of strategies to keep children safe in cold-

weather play is working well: parent satisfaction is very high, and rates of safety incidents are low. Across the 39 practitioners and nine weeks of data collection, six minor injuries from cold weather were brought to parents' attention, and no cold-weather play injuries needed medical attention. For context, in a traditional program setting with a similar time frame and number of children, it would be anticipated that 16–27 injuries would be brought to parental attention. Of those 16-27 injuries, 1–1.25 of them would be anticipated to need medical attention (per injury rates reported by Hashikawa et al., 2015).

In terms of implications from this study, the findings suggest that as policymakers and other decision-makers develop or revise regulations or guidance regarding cold-weather play, the ramifications of using a single temperature threshold should be considered. A "too-cold" temperature guidepost may unnecessarily restrict the type of play that affords the physical movement needed for children's physical health, particularly since it can be challenging during winter months for children to get the recommended moderate-to-vigorous physical activity indoors. The many other benefits to learning and development that unfold from outdoor play in cold weather may also be unnecessarily restricted. Additionally, a "too-cold" temperature guidepost may also communicate "safe" conditions, that, if unaccompanied by practitioners' knowledge, experience, and use of strategies to keep children safe, or in the absence of children's readiness (i.e., proper gear, gross motor skills to allow sufficient physical movement to stay warm, etc.), may actually be quite unsafe.

Echoing the advice of practitioners, flexibility is needed to account for the range of factors that go into the nuanced decision-making necessitated by cold-weather conditions. As illustrated in this study's findings, the practitioners had children's best interests in mind and were very attentive to practices that keep children safe during outdoor play in sub-zero temperatures. Their self-imposed attentiveness was developed and supported through personal experience and professional learning, often in the form of networked learning that facilitated the creation and sharing of knowledge, as well as collaborative inquiry and problem-solving. Thus, flexibility in the context of cold-weather play needs to be coupled with ensuring that practitioners are developing and drawing upon "know-how" knowledge and experience to manage the associated risks. In addition to supporting practitioners' procedural knowledge, outdoor and environmental education organizations and providers of early childhood professional development may want to incorporate opportunities for practitioners to experience the unique benefits and developing a personal appreciation for the seasonality of the places where they live and work, as this appears to be motivating factors that help practitioners overcome the barriers of time and effort.

In conclusion, the weekly reporting logs and questionnaire data from this study suggest that practitioners value the unique benefits of cold-weather play and are very attentive to practices that keep children safe during outdoor play in sub-zero temperatures. Through the use of a variety of strategies, providers are safely bringing children outdoors despite very cold temperatures that occur during program hours. Even on days with reported "real feel" temperatures as cold as -39 degrees F, most are providing time outdoors. A better understanding of what nature preschool providers are currently doing to support outdoor learning in winter environments can help counter cold-weather safety concerns among decision-makers, such as administrators and lawmakers, toward furthering the movement for outdoor learning in public and private preschool settings.

ACKNOWLEDGEMENTS

The authors wish to gratefully acknowledge the funding source for this evaluation, the George B. Storer Foundation, as well as the experts who provided guidance on the study purpose and methodology - Camille Driver, Jennifer Kollerup, Anna Dutke, Kaitlin Erpestad, David Sobel, and Christy Merrick. Additionally, the authors acknowledge and express sincere gratitude for 39 participating programs in Minnesota who enthusiastically, meaningfully, and generously shared their time and expertise.

AUTHORS' NOTE

While beyond the scope of this article, this project also entailed a qualitative study of observations and interviews of nature-based early learning programs, to gather and share in-depth practitioner knowledge regarding how to support cold-weather play opportunities for young children. This procedural knowledge is compiled in the guidebook, *Flourishing in Winter: Guidance for Cold-Weather Play By and For Early Childhood Practitioners*.

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