



Evaluating *iSibWorks*: A virtual cognitive-behavioural intervention for siblings of children with disabilities

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ABSTRACT

Objectives: 1) Examine if participation in *iSibWorks*, a group-based virtual intervention for siblings of children with disabilities, impacted siblings' perception of quality of life (QoL) and social support; and 2) Explore siblings' feedback on *iSibWorks*.

Methods: Thirty-eight children participated in *iSibWorks* and completed questionnaires (Pediatric Quality of Life [PedsQL™], Social Support Scale for Children [SSSC]) one week pre- and post-intervention. Conventional content analysis was used to explore siblings' open-ended responses on a post-participation feedback form.

Results: No significant differences in PedsQL™ and SSSC scores were observed after participating in *iSibWorks*. Despite this, siblings had positive feedback about *iSibWorks* and discussed: 1) Engaging in group learning and activities, 2) Meeting other siblings, and 3) Applying *iSibWorks* content to their daily life.

Conclusion: Factors related to the COVID-19 pandemic such as family stress, school closures, virtual learning, and social distancing likely impacted study results. Although there were no significant changes in QoL and social support, siblings found *iSibWorks* to be fun, meaningful, and engaging.

Innovation: Siblings of children with disabilities can experience psychosocial challenges and there are few virtual interventions designed for this population. *iSibWorks* was adapted to address this gap and increase access and support for siblings of children with disabilities.

1. Introduction

Siblings of children with disabilities may experience significant challenges in their daily life. Throughout this manuscript, the term 'disability' was kept purposefully broad to include siblings of children with various disabilities and to acknowledge their potential shared experience. Research has shown that siblings of children with disabilities can experience greater emotional and behavioural symptoms such as depression which may be related to stress within the family [1-3]. Therefore, siblings of children with disabilities are more likely to experience mental health challenges [4] which often go unnoticed [5,6].

Lower health-related quality of life (QoL) can also be reported by siblings of children with disabilities. Pediatric health related QoL is

unique as it considers developmental changes and accounts for the impact on physical, emotional, social, and school functioning [7,8]. For example, a study showed that healthy siblings of children with chronic disease had lower health-related QoL than siblings of healthy children [9]. Luijckx et al. [10] also examined the experiences of siblings of children with multiple disabilities, and found that having a sibling with a disability impacted siblings' overall perceptions of QoL. Similarly, a scoping review that examined psychosocial adjustment in siblings of children with attention-deficit/hyperactivity disorder revealed that compared to controls, siblings reported lower QoL [11]. For siblings of children with disabilities, important components of QoL could include social support, the ability to complete activities without their siblings, and exchanging experiences with siblings in similar situations [12]. As

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described in Marquis et al. [13] these three contributors to QoL may also act as mechanisms by which interventions could benefit siblings of children with disabilities.

Social support, or, the perceived amount of regard and support received [14], has been noted as an important intervention component for siblings of children with disabilities. A lack of social support is linked to heightened stress, loneliness, and depression, which may contribute to the increased prevalence of mental health and behavioural issues in this population [15]. Children can obtain social support from a variety of sources, including parents, teachers, classmates, and friends [16], and access to these types of support can play a protective role and moderate the ability for siblings to adjust successfully (e.g., developing fewer behavioural problems) [15,17]. Results of a recent systematic review conducted by Kirchofer et al. [15] highlighted the importance of increasing social support to enhance siblings' well-being, as lower levels of support are often associated with negative psychosocial adjustment. These studies suggest that it is important that interventions for siblings of children with disabilities are focused on enhancing siblings' QoL and social support.

Support groups for siblings of children with disabilities and their parents have been shown to mitigate psychological maladjustment in siblings and provide them with opportunities to share experiences, express emotions, and receive support [1,18,19]. For example, *SibWorks* is a manual-based intervention developed for siblings aged 8–13 years of children with disabilities [1]. Through group sessions informed by cognitive-behavioural principles, it addresses alterable risk-factors of emotional and behavioural dysregulation, such as perceived lack of social support, sibling relationships, and the use of maladaptive coping strategies [1]. In a randomized control trial of the *SibWorks* intervention, it was found that behavioural and emotional difficulties were significantly reduced immediately post-intervention, and maintained at the 3-month follow-up [1].

Typically, support groups are held in-person, and access can be limited by financial restrictions [20], language barriers [20,21], and rurality [22,23]. During the COVID-19 pandemic, more health services transitioned to virtual platforms to prevent disease transmission, while also promoting accessibility to the public [23–25]. Virtual health provision can also be used to improve access to support for siblings of children with disabilities. Therefore, as a part of a broader study, *SibWorks* was adapted to be delivered virtually, referred to as *iSibWorks*, to enhance accessibility and support for families. The objectives of the study were twofold: 1) examine if participation in *iSibWorks* impacted siblings' perception of QoL and social support, and 2) explore siblings' feedback on *iSibWorks*.

2. Methods

2.1. *iSibWorks* intervention

iSibWorks is a cognitive-behavioural group-based intervention adapted from *SibWorks*, an intervention originally developed by the Siblings Australia Team [1,26]. *iSibWorks* consists of six weekly one-hour group sessions covering similar topics to *SibWorks*, and is delivered virtually via Zoom Healthcare video conferencing software [27]. Similar to *SibWorks*, the *iSibWorks* intervention topics revolve around recognizing similarities and differences between siblings, learning about emotions and problem-solving, gaining social support, developing strategies to cope with stress, and recognizing one's strengths and individuality [1,26]. See Table 1 for *iSibWorks* session topics, goals, and discussion adapted from the original *SibWorks* manual [26]. *iSibWorks* utilizes group learning, discussions, and activities to build connections and foster friendships between siblings. Additionally, prior to each session, parents receive an information sheet outlining the weekly topic discussed to help reinforce these concepts at home.

Groups were facilitated by a clinical psychology doctoral student with support from a research assistant who took notes and assisted with

Table 1
iSibWorks session topics, goals, and discussion.

Week	Topic	Goals & Discussion
1	Getting to Know Each Other	<ol style="list-style-type: none"> 1. Getting to know each other 2. Introduction to the group 3. Getting to know each other's family 4. Reinforce manners and consequences
2	Exploring Differences	<ol style="list-style-type: none"> 1. What do we know about each other? 2. Exploring similarities and differences 3. Learning about disabilities
3	Friendly & Not-So-Friendly Feelings	<ol style="list-style-type: none"> 1. Things I like doing 2. Exploring feelings 3. Social supports
4	Problem Squashing	<ol style="list-style-type: none"> 1. Problem squashing 2. Practicing problem squashing
5	Wiping Out Worries	<ol style="list-style-type: none"> 1. Exploring feelings and coping 2. Coping skills 3. Coping skills in practice
6	Leaving Stronger & Supported	<ol style="list-style-type: none"> 1. Combining information 2. Finding meaning 3. Closure and evaluation

technical aspects of the sessions (e.g., starting polls, responding to messages in the chat). The facilitator and research assistant were trained to deliver the intervention using the *SibWorks* manual and had experience working with children. A registered clinical neuropsychologist was available during the sessions, in the event that a participant or facilitator needed support. Additionally, a safety plan was in place if a participant expressed serious physical or mental health concerns during the session. In order to create a safe and welcoming environment, icebreaker activities were utilized, and a reminder about group rules (i.e., taking turns, being considerate, etc.) was presented at the beginning of each session. An initial feasibility study was conducted with six children in grades 3–8 (approximately 8–13 years) using the virtual *iSibWorks* intervention (manuscript currently under preparation), which demonstrated that the intervention was acceptable, usable, and appropriate for siblings of children with disabilities.

2.2. Design

This study utilized a pre-post single-arm study design. Participants completed questionnaires at two time points: (1) one week pre- and (2) post-*iSibWorks* intervention. They also completed a sibling feedback form at the end of *iSibWorks* to share their experience on intervention participation. Data was collected via REDCap, a secure web-based data management platform [28,29]. Participants received a \$25 token of appreciation to thank them for their time and for participating in the study. This study received research ethics approval from the Holland Bloorview Research Ethics Board (#328).

2.3. Participants

Children aged 8–13 years who have siblings with disabilities ($n = 38$) were recruited. Recruitment utilized convenience sampling via social media and through community organizations (e.g., pediatric services for autism spectrum disorder). To be eligible for inclusion, participants had to: a) be between 8–13 years, b) be siblings of children with disabilities, c) have no developmental disabilities themselves, d) be willing to participate in weekly sessions, and e) have access to a reliable internet connection. The term 'disabilities' was kept purposefully broad and inclusive to account for both physical and mental health diagnoses. Diagnoses were reported by the child's parent, with no time from diagnosis required for siblings to participate. Participants could only join one group and were assigned to groups based on school grade (grades 3–5 or

grades 6–8) and interest in participating at the time of the next available group. Parents of siblings were recruited as part of the broader *iSibWorks* study, in which their involvement was focused on questionnaire completion. This manuscript, however, is focused on siblings' self-reported outcomes apart from sibling disability which was extracted from the parent demographic questionnaire.

2.4. Questionnaires

2.4.1. Demographics

Participant demographic information was collected using a pre-intervention questionnaire. Questions included birth date, age, gender, grade, and access to other social support or mental health services.

2.4.2. Pediatric Quality of Life (PedsQL™)

The PedsQL™ 4.0 is a multidimensional self-report tool measuring health-related QoL in healthy and chronically ill children between 5–18 years [7,8]. The PedsQL™ 4.0 takes approximately five minutes to complete and includes four scales: physical functioning, emotional functioning, social functioning, and school functioning [7,8]. Items inquire about how much of an issue each item has been throughout the past month and are rated on a 5-point Likert scale from 0 'never' to 4 'almost always' [7]. Items in the emotional, social, and school functioning scale are summed to create a psychosocial health summary score, and items in the physical functioning scale create a physical health summary score. All four scales can also be summed to create a total score. Participants self-reported their responses independently or with the support of a research assistant via a REDCap questionnaire. The subdomains of the PedsQL™ 4.0 have been explored in a study with siblings of cancer patients [30] and chronic disease [9].

2.4.3. Social Support Scale for Children (SSSC)

To evaluate participants' pre- and post-intervention perceptions of social support, the Social Support Scale for Children (SSSC) was administered [31]. The SSSC was developed for children 8 years and older and is comprised of subscales that examine perceived social support from four sources: parents, teachers, classmates, and close friends [1,31]. The SSSC includes six items per source of social support, for a total of 24 items [31]. Each item has four response options which correspond to a Likert scale ranging from one (the lowest level of social support) to four (the highest level of social support) [31]. Each subscale is scored individually resulting in four independent scores, one from each source of social support [31]. Like the PedsQL™, participants self-reported their responses independently or with the support of a research assistant via a REDCap questionnaire. In addition, a recent systematic review recommended future studies utilize the SSSC due to its sound psychometric properties and frequent usage in siblings' social support studies [15].

2.4.4. Sibling feedback form

Each sibling was invited to complete a feedback form following the last *iSibWorks* session. The form was designed to obtain participants' feedback at the end of the intervention and has been adapted from the original *SibWorks* intervention [1]. Questions inquired about participants' feelings towards intervention participation, reasons they liked/disliked *iSibWorks*, whether they would recommend *iSibWorks* to other children, and any additional comments on *iSibWorks*.

2.5. Data analysis

Questionnaires were de-identified, and data was analyzed at a group level. All statistical analyses were conducted using R statistical computing software, version 4.2.1 [32]. Descriptive statistics (i.e., frequencies and percentages) were used to summarize participant demographics. The Shapiro-Wilk test was conducted to determine the normality of the PedsQL™ and SSSC data and the appropriate

parametric (i.e., paired samples *t*-test) and non-parametric (i.e., Wilcoxon signed rank test) tests were conducted. For the PedsQL™, the total score, and physical and psychosocial health summary scores were found to be normal. Across the remaining scales, the emotional and social functioning scales were found to be normal, while the school functioning scale was found to be non-normal ($p < 0.05$). For the SSSC, the classmate subscale was found to be normal, and the parent, teacher, and close friends' subscales were found to be non-normal ($p < 0.001$).

Conventional content analysis [33] was utilized to examine participants' responses to the sibling feedback form. Two authors (HAH, SB) independently coded 10 surveys and then met to ensure coding consistency and trustworthiness. One author then coded the remaining surveys with the other author checking for accuracy. Regularly scheduled meetings between the coders allowed any conflicts to be resolved by discussion and, if necessary, by input from a third reviewer. The codes were then organized into categories to capture participants' general feedback on *iSibWorks* participation.

3. Results

Thirty-eight children participated in the *iSibWorks* intervention between May 2021 and March 2022. Nine *iSibWorks* groups were facilitated, each with a duration of six weeks and containing three to six children per group. Please see Table 2 for demographic information.

3.1. Pediatric Quality of Life (PedsQL™)

The PedsQL™ was delivered pre- and post-intervention (see Table 3 for pre- and post-intervention PedsQL™ scores). On pre-post within participant comparison of PedsQL™ scores, no significant changes in

Table 2
Participant demographic information ($n = 38$).

Demographic	Participants
Age, mean (SD)	10.29 (1.37)
Gender, n (%)	
Male	11 (28.95)
Female	27 (71.05)
Sibling disability*, n (%)	
Attention-deficit/hyperactivity disorder	15 (39.47)
Autism spectrum disorder	13 (34.21)
Anxiety	5 (13.16)
Epilepsy/Seizure disorder	5 (13.16)
Genetic condition	4 (10.53)
Developmental coordination disorder	3 (7.89)
Oppositional defiant disorder	3 (7.89)
Cerebral palsy	2 (5.26)
Intellectual disability	2 (5.26)
Language impairment	2 (5.26)
Learning disability	2 (5.26)
Other**	14 (36.84)
Grade, n (%)	
3	6 (15.79)
4	8 (21.05)
5	10 (26.32)
6	7 (18.42)
7	4 (10.53)
8	3 (7.89)
Currently receiving social support services, n (%)	
Yes	12 (31.58)
No	26 (68.42)
Previously attended mental health group, n (%)	
Yes	15 (39.47)
No	23 (60.53)

* Parent reported sibling disabilities. Siblings may have more than one disability.

** All disabilities included in *other* were reported by one family ($n = 1$; 2.63%). Examples of disabilities included in *other*: disruptive mood dysregulation disorder, down syndrome, obsessive compulsive disorder, sensory processing disorder.

Table 3
Pre- and post-intervention PedsQL™ scores.

PedsQL™ Scale	Pre-Intervention Score Mean (SD)	Post-Intervention Score Mean (SD)
Emotional functioning	58.55 (19.38)	63.29 (20.08)
Social functioning	77.50 (16.72)	77.50 (19.02)
School functioning	66.45 (16.27)	67.37 (19.16)
Physical functioning (physical health summary)	79.69 (14.96)	77.04 (20.19)
Psychosocial health summary	67.50 (14.87)	69.41 (17.34)
Total	71.74 (13.77)	72.03 (16.85)

QoL were observed across the six scales including functioning scales, health summary scores, or total PedsQL™ score.

3.2. Social Support Scale for Children (SSSC)

The SSSC was delivered pre- and post-intervention (see Table 4 for pre- and post-intervention SSSC scores). On pre-post within-participant comparison of SSSC scores, no significant changes were observed across the four subscales summarizing social support provided by parents, classmates, teachers, and close friends.

3.3. Sibling feedback form

In general, 67.57% (25 out of 37 children) rated feeling ‘happy’ that they joined *iSibWorks*, while the remaining 12 children (25%) rated their participation feelings as ‘neutral’. When asked if they would participate in a future *iSibWorks* group, 84.21% (32 out of 38 children) responded positively. Most siblings, 92.11% (35 out of 38 children) indicated that they thought other siblings of children with a disability would like to join a group like *iSibWorks*.

Open-ended comments from participants on the sibling feedback form were grouped into three categories: 1) Engaging in group learning and activities, 2) Meeting other siblings, and 3) Applying *iSibWorks* content. Children reported enjoying playing *iSibWorks* games, having discussions, and learning about topics within a group setting. Being among other children with similar lived experiences was a central aspect of participation. In addition to the overall positive feedback on the *iSibWorks* intervention, participants also provided suggestions for future changes to *iSibWorks*.

3.3.1. Engaging in group learning and activities

Participants enjoyed the *iSibWorks* topics and activities, highlighting their interactive and fun nature. For example, ID5 (age 10) wrote, ‘It was really fun to join.’ Among the activities, creative games such as arts and crafts and virtual scavenger hunts were frequently cited as favourites. For example, ID16 (age 9) wrote, ‘I liked the games and the scavenger hunt, and I liked talking about siblings.’

As part of *iSibWorks*, siblings received psychoeducation on several topics related to emotions, problem-solving, and coping with stress. The topic of emotions was well-received by participants, noting that the session helped them ‘control their feelings’ (ID23, age 8), ‘cope with emotions’ (ID18, age 9), and learn ‘that there are a lot of [different kinds of] emotions’ (ID18). Another example includes:

‘I also liked that we learned about emotions and feelings... Even if we are angry we can also calm down by reading and meditating and those things and not get more angry’ (ID9, age 9).

In addition, problem-solving and coping strategies were noted several times in the sibling feedback form as skills learned. For example:

‘Because it actually really help[s] them learn how to communicate with them [my sibling] and solve problems and live in harmony’ (ID11, age 10).

‘I also learned how many coping skills I had’ (ID5, age 10).

3.3.2. Meeting other siblings

Many children shared their enjoyment of getting to know one another, noting that being with other siblings was fun. *iSibWorks* aimed to create a safe and welcoming space for siblings to connect and express their feelings. Overall, the feedback seemed to indicate that this was achieved in the groups, with one participant noting that:

‘I learned that there are a lot of other people like me and also that I should probably be myself...I liked it because I can express how I feel, I can just basically be myself’ (ID35, age 10).

‘It is nice to have somewhere safe to share your feelings’ (ID45, age 11).

Participants mentioned that they learned from their interactions and connections with the group. Additionally, they shared how hearing about others’ experiences, stories, and ways they handle different situations helped them gain valuable insights.

‘I liked how I got to meet new people who have a sibling who has a disability and how we could learn different ways to get through problems’ (ID5, age 10).

Multiple siblings noted that the group helped them to realize there were other siblings in a similar situation.

‘I really liked that there were a lot of other kids around my age that were in similar situations, some of them were similar and some of them were different but almost all of us could relate to a lot of the situation’ (ID41, age 11).

Participants also emphasized the value of feeling understood by the other children in the group due to their shared experiences as siblings.

‘I like that now I know there are other kids that are around my age that have to deal with the same kind of things that I have to deal with my sibling’ (ID31, age 10).

3.3.3. Applying *iSibWorks* content to daily life

Many siblings shared how they appreciated learning from *iSibWorks* through topics, activities, and group discussions. Siblings noted that they could apply the tips and strategies discussed in the group to their daily lives.

‘I like some solutions that I could do with my brother or sister’ (ID23, age 8).

Table 4
Pre- and post-intervention SSSC scores.

Social Support Subscale	Pre-Intervention Score Mean (SD)	Post-Intervention Score Mean (SD)
Parents	3.73 (0.36)	3.71 (0.37)
Teachers	3.46 (0.67)	3.47 (0.63)
Classmates	3.14 (0.61)	3.19 (0.66)
Close friends	3.46 (0.70)	3.60 (0.64)

'Because you learn how to if your sister is feeling bad and someone is bullying him or her you know how to react [to] it' (ID9, age 9).

Overall, siblings reported increased knowledge in solving problems and coping with situations as a result of intervention participation. In addition, several participants wrote that it helped them improve their relationship with their siblings. For instance:

'It kind of helped me to be friends with my brother.... It had a big impact so we can play more together, and I can understand him' (ID11, age 10).

'I learned how to talk to my siblings' (ID16, age 9).

'I learned that sometimes you just have to be patient with your brother and sister' (ID23, age 8).

3.3.4. Suggested *iSibWorks* changes

Suggestions to improve *iSibWorks* included adding more activities and group discussions. For example, ID22 (age 10) wrote, 'you could play more games.' Other suggestions included having the intervention span for a longer duration of time. For example, ID29 (age 11) wrote, '[having *iSibWorks*] longer than an hour and longer than six weeks.' Addressing Zoom-related issues (e.g., inability to keep up with Zoom chat or hear others clearly due to microphone problems) should also be considered to minimize interruptions.

4. Discussion and conclusion

4.1. Discussion

The objectives of this study were to examine if participation in *iSibWorks* impacted the perceived QoL and social support of siblings of children with disabilities, and to explore siblings' feedback on *iSibWorks*. Although findings showed no significant differences between pre- and post-intervention PedsQL™ and SSSC scores, siblings shared positive feedback about the intervention, with almost all participants suggesting that other siblings would like participating in *iSibWorks*.

It is well documented that having a sibling with a disability can impact perceptions of QoL [9,10]. For example, one study found that siblings of individuals with disabilities had significantly lower QoL compared to those without a sibling with disabilities [34]. Therefore, it is critical that this area of functioning is further explored. Based on this literature, QoL is an area that was added to the *iSibWorks* study when adapting the intervention for virtual delivery, however, study results demonstrated no significant differences in participants' pre- and post-intervention QoL. This is consistent with a past study examining the effectiveness of Siblings Coping Together (SibCT), an 8-week intervention for siblings aged 7–16 years of children with disabilities, which also used the PedsQL™ to evaluate QoL [35], and found no improvements in QoL on both child self-report and parent-proxy report after participating in the SibCT intervention [35]. Given the known impact on QoL among children of siblings with disabilities, continued investigation of the impact of *iSibWorks* and similar interventions on QoL is warranted. This may be done through using supplementary QoL measures or qualitative methods. A recent systematic review noted that siblings often have diverse perceptions of QoL based on personal context including family dynamics and social responses [36], and these findings emphasize the importance of providing supportive interventions that target QoL for this population.

Consistent with Roberts et al. [1], no statistical changes in the quantitative measurement of social support (via the SSSC) were found within this study. This finding may be attributed to several factors such as measurement issues due to children underestimating their difficulties at baseline [1]. In addition, quantitative scales such as the SSSC may not be able to fully capture the concept of social support alone [15]. For example, a recent article by Marquis et al. [13] identified that validation

(i.e., realizing that there are other siblings like them) and respite (i.e., getting a chance to participate in an activity alone away from their sibling with a disability) are two mechanisms by which sibling support interventions may positively affect participants. These are benefits that would not have been captured by the quantitative scales used in this study.

Additionally, differences in reliance on social support by gender have been discussed in the literature. For example, in adolescence, girls report increased access and use of informal social support sources compared to boys [37–39]. Furthermore, in times of stress, girls more often utilize their social networks as a tool for coping and emotional support [37–39]. Given this trend, it is essential to continue to mobilize social support and incorporate it in the delivery of sibling-focused interventions to support mental health efforts [40], particularly among boys who may be less likely to seek out social support. As one of the goals of *iSibWorks* is to enhance social relationships, additional focus on this aspect of the intervention may be warranted. Creative ways to enhance social support among siblings, such as having games tailored specifically for virtual delivery and strategies to enhance group rapport, could be implemented in future groups.

An important aspect of this study was the exploration of sibling participants' qualitative feedback of *iSibWorks* using a pre-established sibling feedback form [1]. Despite the non-significant PedsQL™ and SSSC findings, feedback demonstrated that participants enjoyed *iSibWorks*, highlighting the creative games, interactive group discussions and learning, and the opportunity to meet in a safe space to express feelings. The positive feedback received by participants reflects the value of *iSibWorks* in providing psychosocial support for siblings, and that further rigorous evaluation of this intervention is beneficial. Utilizing other avenues to collect qualitative feedback (i.e., surveys, interviews), are essential as they can complement or provide context to quantitative findings, shedding light on additional insights and richness on participants' experiences with *iSibWorks*.

The *iSibWorks* groups were conducted between May 2021 and March 2022 during the COVID-19 global pandemic. Lockdowns and pandemic-related restrictions were not ubiquitous, however, in Ontario, Canada, the location of this study, COVID-19 related factors included increased family stress, rolling school closures with pivots to virtual learning, and social distancing from teachers, classmates, and friends. During the transition to full-time virtual education, it was challenging for some children to remain engaged in their learning, particularly if they experienced pre-existing attentional impairments or other barriers to online access [41]. It is well-documented that 'Zoom fatigue', characterized by difficulty paying attention to prolonged synchronous video meetings, can extend to online learning environments [42]. Therefore, the virtual delivery of the *iSibWorks* intervention in the present study may have been less effective in the context of the COVID-19 pandemic. This global context also had a likely impact on children's perceptions of social support. Though there are few studies investigating the effect of the pandemic's public health measures on children's perceived social support, one study by Zhu et al. [43] found that children reported increased support, perhaps as families spent more time together during quarantine. Consistent with the understanding of gender differences and attitudes towards social support, Zhu et al. [43] also found that female participants were more likely to engage in emotional sharing, and they reported higher social support from friends and family than male participants during the pandemic. Conversely, Vaillancourt et al. [44] suggest that school closures during the pandemic may have led to increased social isolation and poorer mental health outcomes, perhaps due to a lack of face-to-face peer interaction that is necessary for healthy child development and potentially contributing to lower QoL. The complex, lingering effects of the COVID-19 pandemic must be considered when evaluating interventions such as *iSibWorks*, which aim to improve social support and QoL in children.

In addition to intervention delivery during the COVID-19 pandemic, another limitation of this study was that there were more female than

male participants (71.05% female, 28.95% male). Given the value girls place on social support, this may have influenced their desire to participate in a group-based intervention, as well as the findings related to QoL and social support. In future iterations, a more balanced gender composition may lead to more representative and accurate findings. Finally, an increased sample size, including a control group, would allow for more robust statistical analysis. In the future, *iSibWorks* has the potential to be integrated into clinical settings and could be introduced to families at both hospitals and community centers when a sibling with a disability starts receiving services.

4.2. Innovation

Research has shown that the unique needs of siblings of children with disabilities are often unrecognized, which can lead to mental health challenges. Yet there are few interventions available for this population, and most are delivered in-person with few virtual or remote options [23,25]. The *iSibWorks* virtual adaptation aimed to bridge this gap by providing siblings with a safe space to connect with each other, learn about disabilities and emotions, and practice problem-solving and coping skills. Despite *failing* to produce observable statistical changes on QoL and social support questionnaires after participation in *iSibWorks*, the *brilliance* aspect emerges from siblings who participated in the intervention and provided positive feedback related to engaging in fun and interactive group activities, connecting with other siblings, and applying the content and strategies they learned to their daily life. These findings highlight a valuable and meaningful impact that the quantitative measures may not have captured.

The innovative and timely nature of *iSibWorks* promoted increased accessibility and inclusivity, especially during a challenging time (i.e., COVID-19) when support was limited. The landscape of virtual interventions has shifted considerably since this study was conducted and given the timing of the provision of the intervention and data collection, it is likely that the COVID-19 pandemic and related factors such as family stress, school closures, virtual learning, and social distancing highly influenced results and impacted perceptions of QoL and social support. This study highlights valuable lessons for future intervention research, including incorporating diverse methodologies to explore intervention impact and participants' experiences. In addition, it is important to account for, and understand, external factors that can impact intervention participation such as those experienced during the COVID-19 pandemic. Although the quantitative analyses presented in this study were something of a *brilliant failure*, the narratives of the participants suggest that continued exploration of *iSibWorks* as a virtual intervention for siblings of children with disabilities is warranted.

4.3. Conclusion

Overall, study findings suggest that QoL and social support did not change pre- and post-*iSibWorks* participation. Despite these outcomes, exploration of siblings' responses on a feedback form revealed that participants found *iSibWorks* fun, meaningful, and engaging. Results should be interpreted in the context of the COVID-19 pandemic and other disruptions related to school closures, virtual learning, and social distancing. Future interventions for siblings of children with disabilities should consider ways to account for these factors to continue to provide tailored interventions to support this population.

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CRedit authorship contribution statement

Kylie D. Mallory: Writing – review & editing, Writing – original draft, Supervision, Software, Resources, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Hiba Al-Hakeem:** Writing – review & editing, Writing – original draft, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Shazeen Alam:** Writing – review & editing, Software, Resources, Methodology, Formal analysis, Data curation, Conceptualization. **Sandy Brassel:** Writing – review & editing, Software, Resources, Methodology, Formal analysis, Data curation, Conceptualization. **Tamiko Isaacs:** Writing – review & editing, Software, Resources, Methodology, Formal analysis, Data curation, Conceptualization. **Sonya Basarke:** Writing – review & editing, Writing – original draft, Resources, Methodology, Formal analysis, Data curation, Conceptualization. **Marie Hooper:** Writing – review & editing, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Andrea Hickling:** Writing – review & editing, Supervision, Resources, Project administration, Methodology, Data curation, Conceptualization. **Shannon E. Scratch:** Writing – review & editing, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

Declaration of competing interest

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