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## The Feasibility of Taekwondo for Addressing Social Interaction and Social Participation in Children

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# The Feasibility of Taekwondo for Addressing Social Interaction and Social Participation in Children

## Abstract

**Background:** Children with autism spectrum disorder (ASD) often experience physical, social, and emotional barriers that impact participation in extracurricular activities, such as taekwondo. Engaging in taekwondo may provide opportunities for advancing social abilities as well as developing health-promoting behaviors and routines. Therefore, the purpose of this feasibility study was to explore the effectiveness of using a form of martial arts, taekwondo, as an intervention to promote social participation in everyday life.

**Method:** A mixed-methods design was used. Three children between 7 and 8 years of age who met the ASD criteria participated in a 7-week taekwondo program. The children engaged in interviews before and after the program. The parents completed the Autism Social Skills Profile-2 (ASSP-2) and completed pre and post interviews.

**Results:** Four themes emerged from the qualitative data: social interactions, physical abilities, community barriers and supports, and intervention feasibility. Overall, the qualitative data highlighted the children's increased confidence with social interaction, interests in exploring activities, and program satisfaction. Although not statistically significant, the ASSP-2 scores increased for each child after participation in the program.

**Conclusion:** This study suggests that taekwondo may promote self-confidence in social and physical abilities, leisure exploration, and participation in children with social interaction skills deficits.

## Comments

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## Keywords

occupational therapy, autism spectrum disorder, social interaction skills, taekwondo

## Cover Page Footnote

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## Credentials Display

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Autism spectrum disorder (ASD) refers to a range of behaviors in which individuals have persistent deficits in social interaction skills across different contexts and demonstrate restricted, repetitive patterns of behaviors, interests, or activities (American Psychiatric Association, 2013). Currently, one in 59 children are diagnosed with ASD, which represents a 15% increase in prevalence in the United States since 2014 (Bao et al., 2018). Nearly 40% of children with disabilities are overweight or obese, placing them at a higher risk for health conditions (Curtin et al., 2010; Lawson & Foster, 2016). Difficulty sleeping, psychopharmacological side effects from common medications, unhealthy food selections, and a preference for sedentary activities, such as video games, are a few examples that increase the health risks associated with unhealthy weight gain and obesity (Curtin et al., 2010; Lawson & Foster, 2016). Further, only 16% of children with ASD participated in organized sports, making this population the lowest group of children with disabilities to engage in physical activities (Government Accountability Office, 2010). Participation in physical activity not only improves physical health but also promotes social engagement and encourages the development of social interaction skills (Eime et al., 2013).

Social interaction skills are defined as the “occupational performance skills observed during the ongoing stream of a social exchange” (Boyt Schell et al., 2014, p. 1241). These skills include initiating and ending conversations with peers, taking turns, using goal-directed social interactions, self-regulating emotions, and limiting repetitive patterns of behaviors that are not related to the social situation. Nonverbal behaviors, including positioning self, sustaining appropriate space from peers, and maintaining eye contact are also social interaction skills (AOTA, 2014).

Children who demonstrate difficulties with verbal and nonverbal social interaction skills have difficulty initiating and maintaining conversations, which hinders meaningful experiences with peers (Griswold & Townsend, 2012). Challenges with social interactions skills are important to consider as children with ASD often experience physical, social, and community barriers to participation as compared to typically developing children (Brewster & Coleyshaw, 2010; Must et al., 2015). Physical barriers include physical limitations, such as difficulties with motor skills, balance, and coordination (Brewster & Coleyshaw, 2010). Social barriers can be from the environment or limitations in the child’s social interaction skills, such as negative reactions from peers, difficulty understanding social situations, and difficulty initiating conversations (Brewster & Coleyshaw, 2010). Community barriers are related to the resources, services, and access available to families, such as a lack of trained staff and limited adaptive community programs (Brewster & Coleyshaw, 2010; Must et al., 2015; Patatas et al., 2016). Children with ASD may benefit from increased opportunities to engage in extracurricular physical activities in a naturalistic setting as a means to advance their social interaction skills as well as to develop health-promoting abilities and routines (Eime et al., 2013).

Research evidence suggests a positive correlation between motor skills and social interactions skills in children with ASD (Holloway et al., 2019). In a study examining the impact of general physical activity among children with ASD, it was reported that social interaction skills were developed through teamwork opportunities while increasing self-esteem and confidence (Najafabadi et al., 2018). In 2015, Bahrami and colleagues (2015) reported that engaging in karate, a form of martial art, improved social interaction skills among children with ASD. They proposed a neurobiological mechanism whereby increased levels of brain-derived neurotrophic factor following physical activity impacted neurological functioning associated with improvements in memory and learning capacity, and ultimately improvements in social interaction skills (Bahrami et al., 2015). Taekwondo, a Korean martial art, can

be an engaging physical activity for children with ASD (Kim et al., 2016). Taekwondo is prominent for its use of leg and kicking techniques compared to other martial arts and is described as an art directed toward the moral development of its students (Park et al., 2013). Taekwondo may be used as a therapeutic strategy to promote physical activity and offers the flexibility to modify and adapt the movements and the environment to address specific needs of children with ASD (Kim et al., 2016). Kim and colleagues (2016) conducted an 8-week taekwondo program for children with ASD and found that those in the intervention group significantly improved their balance and reported a high rate of program adherence.

Taekwondo techniques are typically taught in classes involving interaction with the instructor and classmates through group and partner activities (Park et al., 2013), providing further opportunity for social interaction skills development. The benefits of participating in taekwondo could transfer to a child's school, community, and home; however, there is a paucity of research on the impact of engaging in martial arts as a leisure activity to improve social interaction skills in daily life (Kim et al., 2016). Therefore, the purpose of this feasibility study was to explore the effectiveness of using a form of martial arts, taekwondo, as an intervention to promote social participation in everyday life.

## **Method**

### **Design**

This feasibility study examined both the implementation of the taekwondo intervention and the assessments used to verify the need for continued research in this topic area (Bowen et al., 2009). A convergent mixed-methods design was used to examine the changes in children's social interaction skills after engaging in a taekwondo program. This design allowed the researcher to integrate both the quantitative and qualitative data to comprehensively interpret the overall results (Creswell & Creswell, 2018). Data were collected through semi-structured interviews with the children before and after participation. In addition, the parents engaged in interviews and completed the Autism Social Skills Profile-2 (ASSP-2) before and after the program. The taekwondo program was led by the first author who is a licensed occupational therapist, third degree black belt in taekwondo, three-time United States National team member, and a practitioner of the sport for 18 years. Two volunteers who completed their occupational therapy program and had no martial arts experience assisted in the weekly sessions. Institutional review board approval was granted by the university and the study was registered as a clinical trial, NCT03912896.

### **Participants**

Child and parent participants were recruited through flyers shared by the staff from a private, outpatient pediatric facility in Southern California. To be included in this study, children had to be between 7 and 11 years of age, have a formal diagnosis of ASD, or meet the criteria from the DSM-V for the communication challenges for children with ASD (American Psychiatric Association, 2013). Eligibility was determined by asking screening questions such as: "Does your child have difficulty starting conversations with others? Does your child have difficulty playing with other kids their age?" In addition, the participants needed to understand English, be able to follow directions, and be able to physically participate without the use of adaptive equipment. Informed consent was obtained from all participants in this study.

### **Procedures**

The child participants attended the taekwondo program once a week for 45 min for 7 weeks from July to September 2019 (see Table 1). The sessions occurred in a large gym while other classes were

happening. Each class began and ended with meditation and deep breathing exercises. The researcher went over the handouts with the parents and children to introduce the topic of the week. Each topic was a tenet of taekwondo focused on the philosophy of the sport and strategies to incorporate them into everyday life. The warm-up involved jogging, jumping jacks, and stretching to physically prepare for taekwondo. Group and individual activities incorporated the basic movements of the sport such as kicking, blocking, and striking. Games like obstacle courses and relay races were completed near the end of the session. Social interaction skills training was embedded throughout the course of the program, such as engaging in partner activities and taking turns during group activity. During the program, the parents provided prompts to encourage their child to practice the social strategies that were taught. For example, the first handout encouraged the participants to say hi, introduce themselves, and ask a peer their name. At the beginning of the second session, the parents encouraged their child to practice the strategy to learn their peers' names.

**Table 1***Weekly Taekwondo Session Outline*

| <b>Week #</b> | <b>Session Outline</b>   |
|---------------|--|
| 1             | <ul style="list-style-type: none"> <li>• Tenet: Introduction to the meaning of Taekwondo: A martial art that teaches self-defense or how to protect yourself. Taekwondo helps our bodies feel stronger, teaches us to be kind, gives us confidence, and to talk to others with a calm voice.</li> <li>• Group activities: Basic blocks (high, low, middle) and strikes (body, face) in horse stance.</li> <li>• Stretch kick and circle kick facing the mirror and line drills with a target.</li> </ul> |
| 2             | <ul style="list-style-type: none"> <li>• Tenet: Courtesy: We need to be kind, respectful, and listen to our teachers, friends, and family.</li> <li>• Partner activities: Continue to review basic blocks and strikes in horse stance while facing a partner. Partners are 3–4 feet away from each other.</li> <li>• Group activities: Review stretch kick and circle kick. Introduce round kick and side kick.</li> </ul>   |
| 3             | <ul style="list-style-type: none"> <li>• Tenet: Self-control: Keeping our body calm when we have a lot of energy, taking a breath when we feel angry, and waiting patiently.</li> <li>• Group activities: Introduce front stance and incorporate basic blocks and strikes using dynamic movements. Continue to review kicks.</li> </ul>  |
| 4             | <ul style="list-style-type: none"> <li>• Tenet: Integrity: Being honest and truthful when we make mistakes.</li> <li>• Partner activities: Basic kicks in a stationary stance facing partner.</li> <li>• Group activities: Review basic blocks and strikes using dynamic front stances. Introduce combination kicking (i.e., double round kick, stretch kick and circle kick, round kick and stretch kick).</li> </ul>   |
| 5             | <ul style="list-style-type: none"> <li>• Tenet: Perseverance: No matter how hard something is, we must never give up and try our best. Group activities: Review stationary stances with blocks and strikes.</li> <li>• Partner activities: Kicking drills, strengthening activities.</li> </ul>  |
| 6             | <ul style="list-style-type: none"> <li>• Tenet: Humility: It is okay to ask for help and help those that look like they need it. Being able to say sorry when we are wrong and be thankful for what we have.</li> <li>• Group activities: Review basic kicks, dynamic stances with blocks and strikes.</li> <li>• Partner activities: Strengthening, holding target for partner during kicking drills.</li> </ul>  |
| 7             | <ul style="list-style-type: none"> <li>• Tenet: Indomitable spirit: To always be hopeful, brave, strong, and face each day with a smile.</li> <li>• Group activities: Review all skills.</li> </ul>  |

## Instruments

A demographic form was created for this study and included information about the parent-child participant pairs. The demographic form included information such as ethnicity; marital status; number of children in the household; age their child was diagnosed with ASD; and frequency, duration, and setting of therapy services.

The ASSP-2 is a comprehensive measure of social functioning for children with ASD (Bellini & Hopf, 2007). The purpose of the ASSP-2 is to be used as an intervention planning tool to identify social interaction skill difficulties and to measure the progress of the intervention in place (Bellini, 2016). The items on the ASSP-2 represent a broad range of social behaviors typically exhibited as a challenge by individuals with ASD, including limited initiation skills, social reciprocity, perspective-taking, and nonverbal social interaction skills (Bellini & Hopf, 2007). High scores on the ASSP-2 indicate frequent use of socially appropriate behavior. Studies evaluating the psychometrics of the ASSP-2 have found that the measure has high internal consistency ( $\alpha = .940$ ) and test-retest reliability ( $\alpha = .904$ ) (Radley et al., 2017). The ASSP-2 has 49 items and each item is rated on a 4-point Likert scale ranging from *never* (1) to *very often* (4). Examples items are “invites peers to join him/her in activities”, “talks about or acknowledges the interests of others”, and “initiates greetings with others.” Subscales include the Social/Emotional Reciprocity (SER) scale, the Social Participation/Avoidance (SPA) scale, and the Detrimental Social Behaviors (DSB) scale. The SER items are related to maintaining social interactions and taking others’ perspectives, the SPA items refer to the child’s social engagement or social withdrawal, and the DSB items include socially inappropriate behaviors leading to negative peer interactions (Bellini, 2016; Bellini & Hopf, 2007). The items in each subscale represent the behaviors that became the focus of the intervention (Bellini, 2016).

Semi-structured interview questions were developed using the model of social interaction and *The Occupational Therapy Practice Framework: Domain and Process* (OTPF-3) (AOTA, 2014; Doble & Magill-Evans, 1992). Pre program interviews focused on identifying current observations and experiences the parents identified related to physical and community barriers, social interaction skills, and engagement in everyday life. Pre interview questions for the children focused on understanding their perspectives of participation during social activities. They were asked, “What do you like to play with your friends? What do you like to talk about with them? Tell me about a time it wasn’t fun to play with them.” Post program interviews focused on the parents’ observations of changes in their child’s behaviors after participating in the 7-week taekwondo program. After the program, the children were asked about their experiences in the program, such as, “What is your favorite part about taekwondo? Was it difficult sometimes?” The interviews were conducted in person or via video or a phone call. The parent interviews ranged from 9 to 15 min, while the child interviews were between 3 to 9 min.

## Data Analysis

Convergent mixed-methods design has three phases of analysis (Creswell & Creswell, 2018). First, the semi-structured interviews were transcribed verbatim and uploaded into Dedoose (Version 8.2.14, SocioCultural Research Consultants, 2019). Dedoose is a web-based application that is used for organizing and coding qualitative data. Pre and post interviews from both children and parents were coded using a directed content analysis approach to explore the impact on social interaction skills and everyday life (Creswell, 2016). Emerging themes were detected through analyzing the frequencies in each code, condensing codes, and creating concept maps (Creswell, 2016). Validity strategies used in this study were triangulation using the transcriptions from interviews with parents and children,

researcher field notes, and observations. The research team established intercoder agreement through shared analysis, code cross-checks, and regular documented meetings (Creswell & Creswell, 2018). In the second phase of analysis, the quantitative assessment data were entered into Excel 2016 and data were analyzed using SPSS 25. Wilcoxon signed-rank tests were applied to compare pre and post scores on the SER, SPA, and DSB scales. In addition, Wilcoxon signed-rank tests were used to compare changes in overall ASSP-2 standard and percentile rank scores. All analyses were performed at an alpha level of .05. In the last phase, both the qualitative and quantitative data were integrated by merging the results using a side-by-side comparison (Creswell & Creswell, 2018).

### Results

There were six participants (three child–parent pairs) for this study (see Table 2). Pseudonyms were assigned to protect the participants' privacy. Each child was concurrently receiving outside therapy services, such as speech and language, occupational, and behavioral therapy, while participating in the program. Information about the child's diagnosis, age, grade level, form of communication, and attendance during the taekwondo program is listed in Table 2.

**Table 2**

*Summary of Demographic Information from Child-Parent Participant Pairs*

| <b>Parent Participant</b>                         | <b>Amanda</b>   | <b>Brenda</b>   | <b>Carole</b>   |
|---|---|---|---|
| <b>Age</b>  | 31–40   | 41–50   | 41–50   |
| <b>Ethnicity</b>                                  | Caucasian   | Caucasian   | Asian   |
| <b>Highest Level of Education</b>                 | Bachelor's Degree   | Doctorate Degree  | Some College Credit   |
| <b>Profession</b>                                 | Teacher   | School Psychologist   | Accountant  |
| <b>Marital Status</b>                             | Married   | Married   | Married   |
| <b>Number of Children in Household</b>            | 3   | 3   | 1   |
| <b>Child's Name</b>                               | Andy  | Billy   | Chloe   |
| <b>Child's Age</b>                                | 7   | 8   | 8   |
| <b>Child's School Grade</b>                       | 1st   | 3rd   | 2nd   |
| <b>Form of Communication</b>                      | Verbal  | Verbal  | Communication Device  |
| <b>Age Child was Diagnosed with ASD</b>           | 3   | No Formal Diagnosis   | 2   |
| <b>Frequency and Duration of Therapy Services</b> | <ul style="list-style-type: none"> <li>– Occupational Therapy: 1-Hr 1x Week</li> <li>– No Speech &amp; Language Therapy Services</li> <li>– Behavioral Therapy: 10 Hr a Week</li> </ul> | <ul style="list-style-type: none"> <li>– Occupational Therapy: 1-Hr 1x Week</li> <li>– Speech &amp; Language Therapy: 1-Hr 1x Week</li> <li>– Behavioral Therapy: 1-Hr 1x Week</li> </ul> | <ul style="list-style-type: none"> <li>– Occupational Therapy: 1-Hr 1x Week</li> <li>– Speech &amp; Language Therapy: 1-Hr 1x Week</li> <li>– Behavioral Therapy: 1-Hr 1x Week</li> </ul> |
| <b>Type of Setting Receiving Services</b>         | School, Private Clinic, Home  | Private Clinic, Home  | Private Clinic, Home  |
| <b>Taekwondo Program Attendance</b>               | 6 out of 7 Sessions   | 6 out of 7 Sessions   | 3 out of 7 Sessions   |

The six items in Table 3 show that the total scores for the SER, SPA, and DSB scales; the ASSP-2 total scores; standard scores; and the percentile ranks improved after program completion. The overall mean differences for all six areas was 7.6 with a standard deviation of 6.1. However, the results were not statistically significant (see Table 3). Individual changes from pre to post for all areas of socialization as measured by the ASSP-2 are shown in Figure 1. Andy and Billy attended more sessions than Chloe. Based on the pre and post scores, Andy showed an increase in all areas. Billy showed an increase in his social emotional reciprocity behaviors and a decrease in detrimental social behaviors after the taekwondo program. Chloe improved in her social emotional reciprocity and decreased in her social participation avoidance behaviors; however, there were no changes in her detrimental social behaviors. The ASSP-2 results and the qualitative data showed Andy improved in his social emotional reciprocity and decreased in his social participation avoidance and detrimental social behaviors by his ability to maintain active social interactions, take others' perspectives, and limit inappropriate behaviors. The stories that Amanda reported about Andy being able to share with his peers and being more open to initiating conversations reflect these behaviors. Billy also showed improvements with social emotional reciprocity, decreased social participation avoidance, and detrimental behaviors by having more confidence to teach others new skills, initiate conversations, and explore new occupations. Chloe showed improvements in social reciprocity and a decrease in social participation avoidance by sharing her toys with peers and improving her listening skills.

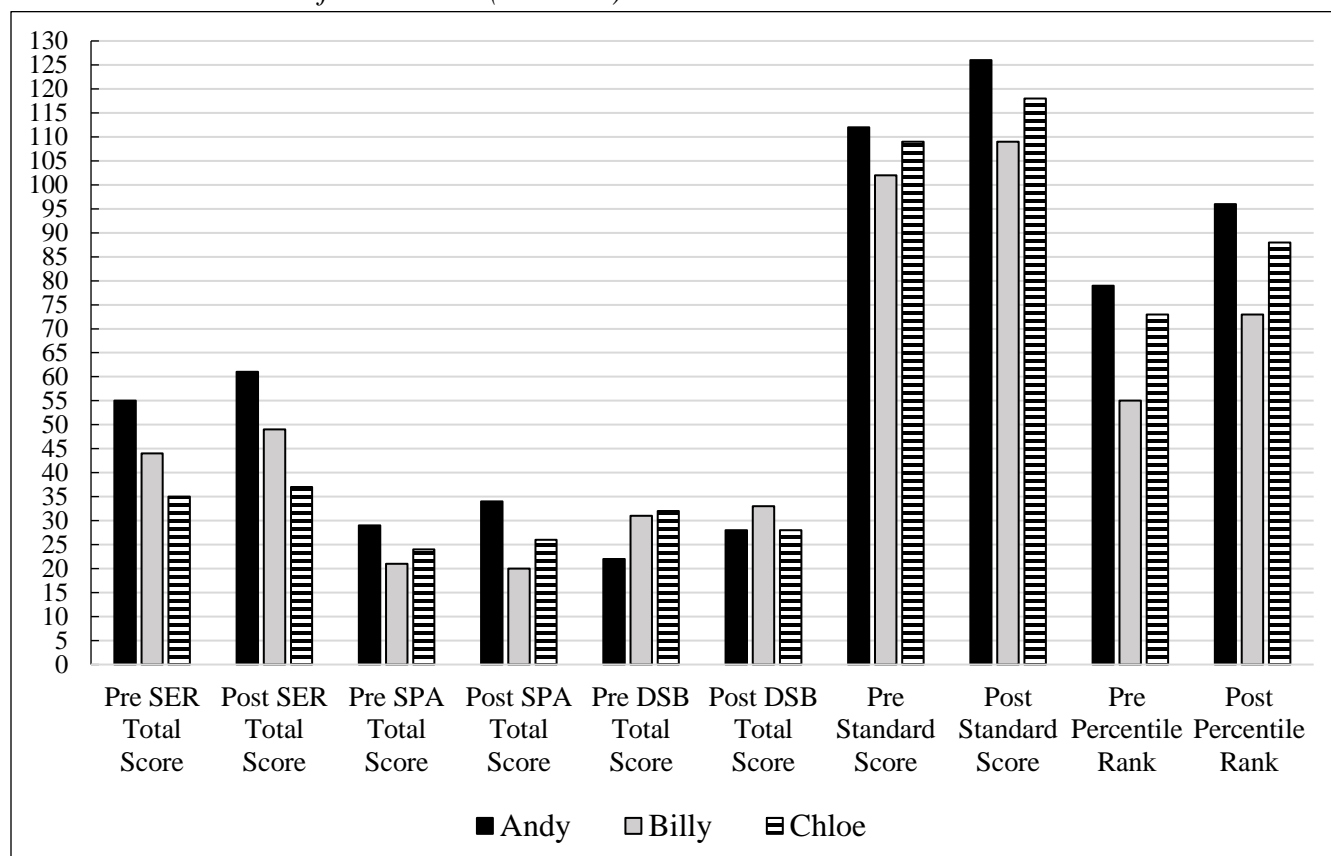
**Table 3***Outcome Measures Before and After Taekwondo Program (N = 3)*

| <b>Measures</b>                                     | <b>Pre</b>   | <b>Post</b>  | <b>P<sup>a</sup><br/>Mean Difference</b> |
|---|--------------|--------------|--|
| Social Emotional Reciprocity (SER)<br>Total Score   | 44.7 ± 10.0  | 49.0 ± 12.0  | 0.109<br>4.3                             |
| Social Participation Avoidance (SPA)<br>Total Score | 24.7 ± 4.0   | 26.7 ± 7.0   | 0.285<br>2.0                             |
| Detrimental Social Behaviors<br>(DSB)Total Score    | 28.3 ± 5.5   | 29.7 ± 2.9   | 0.593<br>1.3                             |
| ASSP-2 Total Score                                  | 114.7 ± 10.0 | 126.0 ± 15.1 | 0.109<br>11.3                            |
| Standard Score                                      | 107.7 ± 5.1  | 117.7 ± 8.5  | 0.109<br>10.0                            |
| Percentile Rank                                     | 69.0 ± 12.5  | 85.7 ± 11.7  | 0.109<br>16.7                            |

*Note.* Values are presented as mean ± SD.

<sup>a</sup> p- values for the null hypothesis that there is no difference between pre and post.



**Figure 1***Autism Social Skills Profile-2 Scores (Pre/Post)*

Three themes emerged from the qualitative data: social interactions, physical abilities, and community barriers and supports. Social interactions refer to the abilities or limitations in the child's social interaction skills; physical abilities describe their performance in the program; and community barriers and supports captures the resources, services, and access available to the families.

### **Social Interactions**

This section describes the abilities or limitations in the child's social interaction skills. Before the program, the parents shared that the most common social support was their family members. Brenda, Amanda, and Carole all shared that their child plays with siblings, siblings' friends, and other family members. The social barriers identified were challenges with social interaction skills, difficulty with listening to same-aged peers, and expressing their wants. Carole shared, "[Chloe] knows that she cannot talk...[it's] frustrating, she has more behaviors when she cannot communicate." Amanda said that Andy "is interested in making [friends] with other kids...he's not so great at listening to other people's ideas...he wants to be the master player, which doesn't leave room for others." Similarly, Brenda also shared that Billy "isn't great [at] playing with his peers...often times he doesn't want to play the game that they want, or he perceives [that] a role [is] being used incorrectly."

During the pre interviews, the children shared information related to social supports and barriers. Andy shared, "I always get to share and have fun with my friends. It's like there are so many games I play with people." Billy said, "I once sat with friends and we were on the playground and we have like the ball and we were throwing it over this wall." They also shared experiences of being bullied and peers

who were not inclusive. Andy felt sad with a peer that “forces people to do something. He hates a lot of my friends. He pushes me all the way on the tree.” Billy also shared that “one time one of my friends [was] like, no, no talk we’re in the conversation. That might make me a little sad.”

After the program, all the parents noted changes in their child’s social interaction skills. For example, in relation to Andy’s ability to engage with his friends, his mother stated, “I’m very proud of his progress I think it’s really wonderful.” Similarly, Brenda stated “I do think [Billy] improved socially. We saw his little friend walked up [to him]. I don’t know if he would have done that before...and that’s pretty awesome.” Brenda continued to share that Billy started taking on a leadership role. “His brother taught him a new card game, and he’s been really active and trying to get his cousins and teaching [them] how to play the card game.” Carole also noted some improvements and shared that Chloe “understands more of the listening and respect. And I think she understands the basics [of taekwondo].”

Although all the mothers noted positive changes, they also described ongoing social interaction challenges for their children. Amanda said that her son [Andy] is getting manipulated by his peers at school. She shared, “I don’t think he [knows] how to navigate that [situation] and stick up for himself yet...he still needs to work on self-advocacy.” Further, Brenda reported that “he’s not engaging much with the kids [at his school].” Brenda said that Billy needs support and demonstrates more social interaction skills in a structured task. Brenda continued to share that “there is still a challenge, both socially and physically...he doesn’t know how to initiate [with] peers...I would like him to be more engaging and I wish that he had a [close] friend.” Carole similarly noted that in school, Chloe does not have the “opportunity to interact with her peers. If her teacher [helps] her...she will do it.” When Carole visited her at school, she saw her daughter share her toys with a peer, but she would just leave without interacting with them. Carole shared that “she doesn’t know how to play but she likes to be around [her peers].”

Throughout the taekwondo program, the parents demonstrated the use of the handouts by reminding their child about the tenets of taekwondo during the beginning and end of each session and referred to the strategies provided in the handout to teach them the skills. Based on the field notes, Billy was able to define the tenets, refer to the handout for strategies to use, and asked questions regarding the tenets. Before the sessions would start, Andy would wait in the lobby and was able to independently ask peers in the other taekwondo classes what their name was and introduce himself. Andy even asked two peers outside of the program if he could sit with them to watch the television.

### **Physical Abilities**

Physical abilities describe the children’s performance before and after participating in the program. Prior to the program, the parents shared that their child’s poor motor skills made it difficult for them to participate in physical activity and play with their peers. Brenda said that her son Billy is “not the most coordinated kid, not really athletic and his motor is a little off.” In addition, Amanda shared “[the] other kids are running and doing [and] he can’t keep up...his hand eye coordination is bad.” These difficulties in motor skills made it challenging for them to keep up with their classmates. For Billy, he just liked to “walk around” at school and preferred to play with his computer.

After the taekwondo program, the parents reported to observe their child engaging in more physical activity. Brenda shared, “[Billy] is more excited about physical activity...before he was more scared to try something.” Amanda said that “[Andy] wants to show off his skills at home.” Carole also shared that she enrolled Chloe in karate classes and said, “I think [taekwondo] gave her more of an understanding in the karate class since it is similar.”

## Community Supports and Barriers

Community supports and barriers captures the services and access available to the families. The parents shared that there is a lack of community programs that have support and accommodations for their child to participate. Throughout the interviews, the parents shared about the services available to them, namely, therapy resources. Therapy services, such as behavioral therapy, occupational therapy, and speech-language pathology services, were a positive impact on their child's performance.

After the program, the parents reported that their child was more interested in exploring new activities since the program. For example, Brenda shared, "We've been talking about baseball. He seems a lot more interested in physical activities which he had zero interests in." Similarly, Chloe's mom shared that they started karate classes after the taekwondo program ended, "I think she mainstreams from you. It gave her more understanding in the karate class [because] it's almost similar." Before the program, when was asked if Billy has shown interest in wanting to try sports, Brenda responded, "no, totally, no." By the end of the program, the parents requested if they could get information on other martial arts programs that would provide skilled support for their child to be successful.

## Intervention Feasibility

The parents shared their perspectives on the effectiveness of the taekwondo intervention in the post interviews. Two of the parents described their children as having increased confidence, interest in new activities, and increased time spent engaging in physical activities. For instance, Brenda reflected, "I think that he definitely has more physical confidence, and this is huge because he's never had any of it." Amanda shared that her son "is more confident." Further, they described that their children enjoyed the taekwondo class and understood the basic taekwondo movements. Amanda shared, "I feel like he's proud of himself like he did something different." She also shared that "Andy is trying to teach his sister [taekwondo]. They go around the house doing the movements through the hallways like he's her coach." Brenda shared, "I think that he's trying more than he ever would. I think he would have shut the door entirely to taekwondo if he didn't have that experience." Consistent with parent experiences, the children enjoyed the class. Billy expressed, "I just liked taekwondo," and Andy asked, "When am I going [to do] taekwondo?" Billy and Andy said that their favorite part about the program was doing the kicking drills. Andy said, "I liked doing the [taekwondo] kicks." Billy said, "[I] like the double round kick." When Chloe was asked if she missed the taekwondo classes, she used her communication device and replied "yes." Carole shared that she had hoped Chloe could have attended more sessions, but her sensitivity to the hot weather gave her a rash so she was unable to attend all the sessions.

Based on the reports by the participants, using taekwondo was a feasible intervention because it was once a week. Any additional sessions per week would have been difficult for them to attend. However, there were challenges while conducting this program. The environment of the class was busy, and the participants would be distracted by the other people in the room. The small class size made it difficult to engage the participants in more social interactions. Having more participants could have increased opportunities of social interactions among the participants. Having an additional facilitator with a martial arts background would have been helpful when teaching more complex movements. Having someone model movements while also providing instructions could make it easier for the participants to learn. Having a control group would have allowed the research team to better understand the impact of other therapeutic interventions that are occurring at the same time as the martial arts program. Overall, based on the program satisfaction from the parent and child participants, taekwondo can be a feasible intervention to use.

## Discussion

The purpose of this feasibility study was to explore the effectiveness of using taekwondo as an intervention for children with difficulties in social interaction skills and its impact on social participation in everyday life. The most common community barrier experienced by children with ASD is a lack of opportunities to participate in extracurricular activities (Brewster & Coleyshaw, 2010; Must et al., 2015). The findings of this study reflected this barrier and suggest that taekwondo can be structured to offer a supportive environment for children with ASD to apply social interaction skills while increasing their confidence to explore new leisure occupations. Similar to Griswold and Townsend (2012), this study supports the emphasis of social interaction skills being an essential part of childhood occupations because it allows children to interact with others so that they can participate in a variety of settings.

For the participants of this study, improvements in their social interaction skills affected their social participation in meaningful occupations. These findings are consistent with Bahrami et al. (2015) who reported increased social interaction skills among children with ASD after engaging in martial arts, demonstrated by the children asking more questions, paying more attention to instructions, and interacting with their peers during group play (Bahrami et al., 2015). The pre and post results from the ASSP-2 and the qualitative data from the interviews did indicate a change in social interaction skills after program implementation despite there being no statistical significance. Because this assessment is used to measure the progress of an intervention, it would be beneficial if the ASSP-2 could also be conducted at three different times as opposed to the two in this study. The results of this assessment could have shown increased positive changes if the program were conducted over a 3-month period. If the participants engaged in the program once a week for 3 months, more opportunities for change in social interaction skills could be seen. Gathering information on the effectiveness of the program during the beginning, middle, and end of the program could help assess whether the intervention needs to be adjusted. This study used the ASSP-2 before and after to assess the changes in social interaction skills. However, the purpose of the tool is to measure the progress of the intervention and its impact on the participants' social interaction skills.

Increased confidence in social interaction skills through leisure exploration can help a child transfer social and physical skills into other contexts in their everyday life. After participation in the program, Andy and Billy demonstrated increased confidence through approaching peers, sharing toys, and trying novel activities. Studies have found that children may increase their confidence through opportunities for social engagement and occupational exploration (Guest et al., 2017; Kugel et al., 2017). Increased self-confidence may lead to improved social interaction skills to participate in new environments (Guest et al., 2017). Knowing that their child enjoyed the physical activities, such as the kicks, the parents were seeing increased confidence and interest in other novel activities, such as baseball and karate. Other studies have found that the confidence from learning a new skill can lead to making new friends, developing teamwork, and increasing social interaction skills after participating in group physical activity (Bahrami et al., 2015; Eime et al., 2013). Martial arts or learning a new skill in a supportive environment may encourage children to grow, learn, apply, and generalize their new abilities. This could affect their ability to socialize with others in various social contexts.

This study is unique and supports other research because taekwondo is a leisure occupation that supports the development of performance skills such as motor, processing, and social interaction skills that can lead to positive social participation in the community. This study involves an occupational therapist with martial arts training to explore the impact on social interaction skills outside of physical

activity contexts. Intertwining the experiences and expertise of both backgrounds allowed the facilitator to modify and adapt teaching strategies, equipment, and the environment for the participants to learn new skills. Occupational therapists have the ability to analyze the client factors and performance skills that are required for physical activities (AOTA, 2014). Using this information to assess an individual's performance can allow the professional to develop an intervention plan that is motivating and meaningful to the individual (AOTA, 2014; Griswold & Townsend, 2012). Although the facilitator has an extensive background in taekwondo, the basic movements can be taught by an occupational therapist with no formal martial arts experience. The program outlined in Table 1 was included in this study to be used as a guide for future programs. An occupational therapist can use this opportunity to partner with a taekwondo instructor in the community to learn the basic movements that can be taught to their clients. The movements in taekwondo involve bilateral coordination, contralateral and ipsilateral stances, motor planning, executive functioning, praxis, and social interaction skills. All these areas are the underlying factors that promote participation in daily occupations and are in the scope of occupational therapy. This could lead to a professional partnership between an occupational therapist and a taekwondo instructor for collaboration to help mainstream children with social interaction skills challenges into a community-based taekwondo program.

### **Implications for Future Research**

- Conducting this study with a larger sample size and expanded age ranges of children with ASD.
- Using additional assessments to measure social interactions skills and physical movements to show changes in the participant's performance.
- Conducting the program for a longer period will allow researchers to assess change over time.
- Collaborating with additional occupational therapists and martial arts instructors to design the program together. This could create a collaborative opportunity to design a program and mainstream it into the community for children with special needs.
- Conducting this study with a control group would allow the research team to better understand the impact of other therapeutic interventions that are occurring at the same time as the martial arts program.

### **Limitations**

There are several limitations to this study. The main limitation is the small sample size. Because of the small sample size and the limited time of the program, the findings of this study may not generalize to other children who meet ASD criteria. The children were engaged in other therapy during the program, which may have had an impact on the effectiveness of the program outcomes.

### **Conclusion**

The results of this study suggest that taekwondo may promote self-confidence in social interaction skills, leisure exploration, and participation in children with social interaction skills deficits. Overall, this study found that creating opportunities to engage in new activities impacted the participants' self-confidence to explore novel tasks outside of their comfort zones. Occupational therapists can use their knowledge and skills to facilitate participation in taekwondo for children with social interaction skills deficits as well as address client factors and performance skills to develop social interaction skills and transfer these skills to everyday life.

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