

The feasibility of a family-based judo program for children with Autism Spectrum Disorder

Jeanette M. Garcia (✉ jeanette.garcia@ucf.edu)

University of Central Florida

Caitlyn T. Perry

University of Central Florida

Michelle L. Murray

University of Central Florida

Kayla M. Lavery

University of Central Florida

Keith Brazendale

University of Central Florida

David H. Fukuda

University of Central Florida

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Abstract

This study examined the feasibility of a 15-week family-based judo program for youth with Autism Spectrum Disorder. Nine children and their parents participated in the family class, and eight children participated in the child-only class. Judo sessions were held once a week for 45 minutes. Feasibility measures included attendance records, retention rates, program implementation fidelity, and participant acceptability. The family class had a significantly higher attendance rate ($13.22 \pm .44$ classes) compared to the child-only class (9.9 ± 2.5 classes, $p = 0.007$), with 100% of the family class attending at least 80% of the sessions, compared to 38% of the child-only class ($p = 0.005$). Parents from both classes felt the program was a positive experience, however, parents in the family class emphasized social benefits while parents from the child-only class highlighted physical benefits. Future studies should examine the benefits of a family judo program on children *and* participating family members.

Introduction

Physical activity (PA) has been shown to provide both physical and psychological health benefits in children and adolescents [1–2]. For youth diagnosed with Autism Spectrum Disorder (ASD), participation in PA may provide additional benefits compared to their neurotypical (NT) peers [3]. Previous work has shown that participation in PA may help to improve primary symptoms of ASD, such as difficulty with social interaction and language deficits [4]. Unfortunately, the majority of youth with ASD do not meet the recommended levels of PA [3, 5]. Therefore, it is imperative to offer PA programs that are beneficial and acceptable to this population.

Prior studies have found that PA that includes a mind-body component, such as yoga, may be particularly beneficial to children with ASD [6]. Martial arts may be a mind-body activity that is preferable to children with ASD due to its structured and repetitive format [6–7]. Judo is a more traditional form of martial arts that consists of a unique blend of mindfulness exercises, and techniques to improve balance, coordination, flexibility, and core strength [8]. Unlike other forms of martial arts that may emphasize combative techniques, judo focuses on self-regulation, discipline, and self-defense [7–8]. Only a few studies have examined the benefits of judo on youth with ASD, however, the findings have been positive [7, 9–10]. Garcia et al [9] found that a judo program for youth with ASD was feasible, acceptable to participants, and resulted in a significant increase in participant PA. A similar study by Rivera et al. [7] reported that parents of youth with ASD who participated in an eight-week judo intervention observed an increase in confidence and social interaction in their children.

Interestingly, a recent study examined a remote-based judo program for youth with ASD, where participants logged into the Zoom sessions from their home. It was noted that parents expressed an interest in their child's participation in the judo exercises, and provided encouragement during and in-between sessions [10]. Prior research suggests that parent support is critical to promote PA participation in youth with ASD, and increases the likelihood of the child's continued engagement in PA [11–12]. Additionally, judo may have beneficial effects on families of youth with ASD [13]. Families of children

with ASD tend to experience a greater level of stress compared to families of NT children [14–18]. The additional responsibilities that are required of families caring for youth with ASD can negatively affect family functioning, and result in lower quality of life for both the family and child with ASD [19–20]. Thus, engagement in a family activity that is geared towards improved physical and mental health may be beneficial to the entire family unit, and have the potential to strengthen the relationship among family members [21]. For example, a study by Garcia et al. [22] reported that parents of children with ASD who participated in concurrent yoga sessions with their children reported experiencing a reduction in stress levels and spending more quality time with their children as a result of the program, however, this study had parents and children in separate yoga sessions rather than a combined family session.

Despite the importance of family engagement for youth with ASD and the potential benefits of a mindfulness-based PA program to family members of youth with ASD, no studies have examined the feasibility of a family-based judo program for youth with ASD. Prior research has reported positive findings regarding the role of martial arts for family development in families of NT youth [23]. The current study examines the feasibility and acceptability of both a family-based and child-only judo class for youth with ASD. It is hypothesized that both the family and child-only class will be both feasible and acceptable to participants and their family, the inclusion of parents/caregivers in the judo sessions will result in increased attendance and lower attrition compared to the child-only class.

Methods

Study Design & Sample

This pre-post quasi-experimental study took place at a large public university in Central Florida. The research team partnered with an organization that provides services and resources to families of youth with ASD. All study procedures were approved by the Institutional Review Board (IRB) at the research team's university.

Inclusion/Exclusion criteria.

Children between the ages of 6–19 years old, diagnosed with Level 1 or 2 ASD were recruited to take part in this study. All families were given the option to select the family-based or child-only class. For the family class, a minimum of one adult/caregiver participated in the judo class along with the child. For the child-only class, it was required that a minimum of one parent/caregiver remain in the building where the judo sessions were being held.

Recruitment

Recruitment for both the family and child-only class began eight weeks prior to the start of the program. An email with the description of both the family and child-only classes was sent to all families affiliated with the partnering organization. A registration link was posted at the end of the recruitment email where parents could register their child for either the family or child-only class. A target number of 10

participants/families per class was set. Once that number was reached, parents could register for the other class if there were still spots available or join a waiting list for the specific class. If parents registered their child for the family class, they were asked to include the family members who would also be participating in the judo sessions in order for the investigative team to collect an overall number of participants per class. Parent consent and child assent was obtained from all families prior to participation in study procedures.

Overview of Judo Sessions

Judo Instructors & Staff

A USA Judo certified coach who had experience teaching judo to youth with ASD led each class, along with an assistant instructor. Two registered behavioral technicians were also present at each session to assist with any behavioral issues.

Judo Format

The overall curriculum lasted 15 weeks with once weekly training sessions which were similar in both classes, however, progression for each session was based on each individual class. The format of each session typically included the following format: 1) 5 minute warm-up; 2) 5 minutes of falling/landing practice; 3) 5 minutes of balance training; 4) 15 minutes of judo techniques; 5) 10 sets of partnered exercises to practice techniques; and 6) 5 minute cool-down (deep breathing, stretching).

Baseline Measures

Parent/Caregiver Demographic Survey

Parents/caregivers completed a demographic survey that asked questions pertaining to parent/caregiver relationship to child, race/ethnicity, highest level of education, and current occupation.

Child Information Survey

Parents/caregivers completed a survey that asked for information regarding their child's age, sex, race/ethnicity, estimated height/weight, age of ASD diagnosis, co-occurring health conditions, current medications, and current treatment their child was receiving (e.g. physical therapy). At the end of the judo program, parents/caregivers were asked to indicate whether there were any changes in their child's medication or treatment regimen during the 15-week program.

Autism Behavior Inventory – Short Form

In order to assess ASD-related symptoms, parents/caregivers completed the Autism Behavior Inventory-Short Form (ABI-SF). The ABI-SF is a 24-item survey that asks parents/caregivers to report the quality or frequency of their child's behavior across the following five domains: 1) Social Communication; 2) Restrictive Behaviors; 3) Mood & Anxiety; 4) Self-Regulation ; and 5) Challenging Behaviors [24]. Parent response options were based on a 4-point Likert scale that consisted of either how well the behaviors

were carried out (Not at all; With support; With some reminders; Without help) or the frequency/intensity of the behaviors (Never; Sometimes; Often; Very Often). The ABI-SF has shown to have good test-retest reliability (0.77–0.88) and construct validity [24]. The mean scores were calculated for each of the five domains.

Feasibility Measures

Recruitment & retention

The investigative team tracked weekly registration numbers over the course of eight weeks for both the family and child-only classes to collect information on the time needed to fill both classes. Participant withdrawals from the program were noted and parents were contacted to provide reasons for withdrawing from the program. Based on previous studies, an attrition rate of $\leq 15\%$ was expected for both classes [10, 25]. Additionally, at the start of the program, parents completed an open-ended survey that inquired about reasons for registering for the family and child-only judo sessions.

Attendance

Attendance was recorded each week for both the family and child-only class. Parents of participants were asked to inform staff ahead of time if their child would be absent from a session. The target goal was for participants to attend 70% (12 out of 15) of the sessions provided [10, 25]. Reasons for absences were also recorded.

Implementation fidelity

A research assistant (RA) took observation notes each session to assess the fidelity of program implementation. The RA recorded the duration of all family and child sessions, any deviations from the standard curriculum, and absences of the judo instructors or staff that would result in changes to a session. Additionally, the judo instructors completed an open-ended survey at the end of the program regarding challenges to implementation fidelity and program adjustments.

Acceptability

At the end of the program, parents of participants completed open-ended surveys regarding their thoughts on the judo program. Questions included parent perspective on the program, child reaction to the program, and suggestions for future programs.

Data Analysis

Descriptive statistics were calculated for both the family and child-only sessions. Independent samples t-tests and chi-square tests were conducted to examine differences in sample characteristics between participants in the family and child-only classes. Independent samples t-tests and chi-square tests were also conducted to determine differences in attendance and components of implementation fidelity

between the family and child-only classes. Content analysis was used to examine and quantify the parent open-ended survey responses [26]. Quantitative analyses were conducted using SAS version 9.4.

Results

Sample Characteristics

A total of nine children participated in the family class, and eight children completed the child-only class. For the family class, three of the nine children had both parents in attendance, while the other six had one parent attend the class. Table 1 provides the sample characteristics for both classes. Children in the family class were significantly older when they were diagnosed with ASD compared to children in the child-only class (4.11 ± 1.5 years vs $2.25 \pm .5$ years, $p = 0.04$).

Table 1
Comparison of baseline participant characteristics between family (n = 9) & child-only (n = 8) class

Variables*	Family-class	Child-only	p-value
Years of Age (m ± SD)	12 ± 3.2	11.62 ± 3.5	0.8
Age of diagnosis (m ± SD)	4.11 ± 1.5	2.25 ± .5	0.04
Sex			0.2
Male	8 (89%)	5 (62%)	
Female	1 (11%)	3 (38%)	
Race			0.08
White	6 (67%)	6 (75%)	
Black	0	2 (25%)	
Asian	3 (33%)	0	
Ethnicity			0.45
Hispanic	5 (56%)	3 (38%)	
Non-Hispanic	4 (44%)	5 (62%)	
Weight status			0.71
Healthy weight	6 (67%)	6 (75%)	
Overweight/Obese	3 (33%)	2 (25%)	
ASD Behavior Inventory (m ± SD)			
Social communication	1.74 ± .45	1.94 ± .25	0.77
Restrictive behaviors	1.41 ± .46	.89 ± .39	0.08
Mood & anxiety	1.5 ± .76	1.05 ± .44	0.28
Self-Regulation	1.44 ± .55	1 ± .27	0.16
Challenging behaviors	.67 ± .44	.42 ± .32	0.33
Co-occurring diagnosis	8 (89%)	3 (38%)	0.07
ADHD	6	1	
Mood disorders	0	1	
Anxiety disorder	0	1	

*frequencies & percentages reported unless otherwise noted

Variables*	Family-class	Child-only	p-value
Speech disorder	2	0	
Currently on medication	1 (11%)	3 (38%)	0.2
Current treatment for ASD	4 (44%)	5 (63%)	0.46
Speech/language therapy	3	4	
Physical/occupational	2	2	
Social skills/behavior therapy	2	1	
Other	1	2	

*frequencies & percentages reported unless otherwise noted

Feasibility Measures

Recruitment Rate

Within the first week of registration, seven parents had registered for the family class, and the class was filled by the end of the second week. Three parents had registered their children for the child-only class by the end of the first week, and six children were registered by the end of the second week. At the end of the eight-week recruitment period, 10 families were registered for the family class, with four families on a waiting list. The child-only class had 10 children registered at the end of recruitment, with parents of four of the participants initially attempting to register for the family class.

Reasons for registering for the judo sessions appeared to differ between parents in the family versus the child-only class. The primary reasons for registering for the family program was to participate in an activity together as a family, promote social interaction, and build child self-confidence. The primary reasons for registering their child for the child-only class was to improve body-awareness and coordination, teach discipline, and build child self-confidence.

Attrition Rate

Out of the 10 families registered for the family class, one family dropped out after the second week (10% attrition rate), citing other commitments and long travel time as the primary reasons for withdrawal from the program. Out of the 10 participants registered for the child-only class, two children dropped out of the program by the second week (20% attrition rate). Parents of one participant cited that the child did not wish to participate any longer due to a lack of interest in the program, and parents of the second participant did not respond to follow-up attempts from the research team.

Attendance Rate

Table 2 provides the average attendance rate and reasons for missing class for both the family and child-only sessions. The family class had a significantly higher attendance rate with participants averaging $13.22 \pm .44$ (88% attendance rate) classes compared to the child-only class which averaged 9.9 ± 2.5 (66% attendance rate) classes ($p = 0.007$). All nine participants in the family class attended at least 80% of the judo sessions taught, while only three of the eight (38%) of the participants in the child-only class attended at least 80% of the sessions ($p = 0.005$). For the family class, illness was most frequently reported as reasons for absences, with families also missing the Saturday during spring break due to vacation plans. For the child-only class, the most commonly mentioned reason for absences was prior family commitments, followed by child illness.

Table 2
Attendance information for family (n = 9) & child-only (n = 8) class

Variables	Family	Child-only	p-value
Average attendance (m ± SD)	$13.22 \pm .44$	9.9 ± 2.5	0.007
Attended 80% of sessions (12 of 15 sessions)	9 (100%)	3 (38%)	0.005
Reasons for non-attendance	1. Illness 2. Spring break	1. Other commitments 2. Illness	N/A

Session Implementation Fidelity

All sessions were scheduled to run for 45 minutes each. The observation notes reveal that there was a significant difference ($p = 0.0003$) in class duration between the family and child-only sessions with the family class lasting an average of 43.91 ± 3.53 minutes compared to 38 ± 2.86 minutes for the child-only class. Additionally, there was a significant difference ($p = 0.004$) in class start time delays with the child-only class starting 5.36 ± 1.63 minutes late compared to 2.64 ± 2.2 minutes in the family class. There were no significant differences in finishing time between the two classes ($p = 0.08$). The instructor observation notes also indicated that the child-only classes included group water breaks in 20% of the sessions, which resulted in a 2–3 minute break period in the class, while the family class did not include any group water breaks (individual family members would leave the session briefly to find a water bottle for their child). The instructor observation also noted more one-on-one instructor feedback in the child-only class, and a greater frequency of verbal encouragement from the instructor during the child-only class. In the family class, the parents often modeled judo techniques for their children and provided frequent words of encouragement throughout the class. In the open-ended surveys, the judo instructors both reported that they felt that participants in the family-based sessions progressed further in their judo training compared to participants in the child-only class. They also stated that it was easier for the instructors to focus on the class as a whole with parents guiding their children through the exercises in the family class, rather than focusing on individual participants which was often the case in the child-only sessions. Table 3 presents the comparisons between the two classes.

Table 3
Implementation fidelity for family (n = 9) & child-only (n = 8) class

Variables	Family class (m ± SD)	Child-only class (m ± SD)	p-value
Class duration (minutes)	43.9 ± 3.53	38 ± 2.86	0.0003
Began late (minutes)	2.64 ± 2.2	5.36 ± 1.63	0.004
Finished early (minutes)	0.18 ± 0.4	1.91 ± 2.91	0.08
Observed Differences	Parent modeling	Water breaks; more instructor one-on-one with participants	N/A
Instructor Observations	Greater progression	Shorter focus & attention	N/A

Acceptability

In the end-of-program survey, parents in both the family and child-only classes reported positive feelings towards the sessions. All nine parents in the family class reported that they would be interested in participating in the family class in the future, and all but one of the parents in the child-only class reported an interest in attending future classes. The majority of the parents in both the family and child-only class noted improvements in their child's behavior outside of the program. Parents in the family class noted an increase in social interaction, a greater willingness to try new activities, increased confidence, and an increase in focus at home and in school. Additionally, three of the parents reported their child appeared happier since starting the judo program. Parents of participants in the child-only class reported an increase in confidence, improved motor coordination and balance, and an increase in focus at home and in school. Parents in the family class emphasized the social interaction and family togetherness during the sessions while parents of participants in the child-only class emphasized the effectiveness of the judo instructors when working with their children. Parents from both classes reported their children becoming more confident during the judo sessions throughout the program. Finally, parents from the family class suggested greater mat space so that families could spread out in class, and requested that more opportunities be provided for families to interact with other families in the sessions. Parents of participants in the child-only class requested that there be opportunities for a hybrid class that offered a combination of both child-only and family sessions be offered. Table 4 provides a summary of the parent responses between the two classes derived from the open-ended survey questions.

Table 4
Open-ended parent responses for family & child-only class

Question	Family	Child-only
Child behavior outside of class	More confidence; increase in social interaction; willingness to try new activities; increased focus; increased physical activity; positive mood	More confidence; improved motor coordination & balance; increased focus
Parent observations of class	Improved family relationship; more social interaction between families; Enjoyment of time spent together during the sessions; Increased confidence in class	Instructors were effective; increased confidence in class
Suggestions for future	More mat space for families to spread out; Allow time for more interaction	Mix of family & child-only sessions

Discussion

The current study examined the feasibility of both a family-based judo class and a child-only class in youth with ASD. It was hypothesized that, while both the family and child-only classes would be both feasible and acceptable to participants and their families, the family class would have a higher attendance rate and lower attrition rate compared to the child-only class. Our findings primarily support our hypothesis with the family class having a significantly higher attendance rate and a lower attrition rate compared to the child-only class. Additionally, parents from both classes reported the program as being a positive experience for their child and themselves. The child-only class, however, did not meet the attendance and attrition benchmarks.

The attendance rate was over 20% greater in the family-based class compared to the child-only class, with all nine children in the family class attending 88% (13 out of 15) classes. Although the exact reasons for the difference in attendance between the two classes cannot be derived from the results of this study, there are few possible explanations. First, the direct involvement of parents in the family class may have increased parent engagement and interest in attending the sessions. Second, one of the primary reasons for registration in the family class was to participate in an activity together as a family, thus the classes may be viewed as a high priority for families, thus increasing their level of commitment to the program. This finding is supported in a review by Karst and Van Hecke [17] who reported that direct family involvement may increase both parent and child engagement in an intervention for children with ASD.

A surprising finding was the greater interest in the family class compared to the child-only class during the registration period. The family-class was filled within two weeks, while the child-only class required nearly the full eight-week registration period before it was full. Additionally, not only did the family class have a waitlist in case any child dropped out before the start of the program, several of the parents in the child-only class had initially attempted to register for the family class, but decided to enroll their child in the child-only class when they were informed it was full. Furthermore, even though parents of children in the child-only class expressed satisfaction with the class following the end of the program, several parents did request to have the option to join their child in future judo classes.

This novel study is the first to include the addition of the family into a martial arts program for youth with ASD. In addition to the benefits of family involvement in the program, the logistical advantages are important to note as well. For example, the judo instructors remarked that they were able to focus on the class as a whole, even if a child was being disruptive as the accompanying family member could tend to the child while the class continues. Another advantage of the family class was the ability for the parents to model the judo techniques for their children and assist them when they struggled with an exercise. Thus, the judo instructors commented on the further progression the family class achieved in the program compared to the child-only class. It should be noted, however, that the child-only class was significantly shorter than the family class despite both classes adopting the same curriculum. Based on input from observation notes and the instructor input, participants in the child-only class had more difficulty with focus and concentration during class, especially at the beginning of the 15-week program, which may account for the shorter duration of some of the sessions. Prior research has shown that parent involvement and modeling of behavior may be linked with increased focus and engagement in children with ASD during a PA intervention [27].

The parents in the family class reported that there was an increase in social interaction, not just with their children, but with parents as well. In fact, a suggestion was made to include more opportunities for families to socialize with one another. The benefits of a family class for not only children with ASD, but parents/caregivers as well is of importance to note, given the increase stress and pressures often reported by parents of children with ASD [28]. Furthermore, there is evidence to suggest that a bidirectional relationship exists between parent/caregiver stress and child ASD symptoms. In other words, increased stress levels of the parent/caregiver may exacerbate child ASD symptoms, which in turn, may further worsen parent/caregiver stress [20, 29]. Given the additional strain on families of children with ASD, future research should examine the effects of a family judo class on parent/caregiver physical and psychosocial outcomes.

Limitations

Both the family and child-only classes had small sample sizes, however, the current study was not intended to demonstrate efficacy, but rather feasibility. Therefore, a large sample size was not essential to the study question. Nonetheless, larger sample sizes of youth with ASD of varying severity levels would be necessary to determine the effectiveness of the family judo class, and whether there are differences between the family and child-only classes. Another limitation was the lack of randomization between the family and child-only classes. Parents of participants could select whether they wanted their child to participate in the family or child-only class. While attempts to limit bias were made by requiring parents of the child-only class to remain at the study site during sessions, future research should consider random assignment into either the family or child-only judo class in order to more accurately compare the differences between the two classes.

Implications

While prior studies have demonstrated the feasibility and benefits of child only martial arts programs, these samples have been limited to children with level 1 ASD who need minimal support. As the current study demonstrated, the inclusion of the family unit allows for children who may require additional support to participate in the program. Thus, future martial arts programs can potentially include children with greater ASD severity by adopting a family-based model. Additionally, while prior research has demonstrated the benefits of martial arts programs, such as judo, on physical and psychosocial outcomes in children with ASD, the benefits of a family-based class may extend to parents/caregivers and positively impact family relationships.

Conclusion

Results did indicate that the family class was both highly feasible and acceptable to the parents and children participating in the class, and had a higher attendance rate compared to the child-only class. Further research to determine the effectiveness of the family-based class is necessary.

Summary

The purpose of this study was to examine the feasibility of a 15-week family-based judo intervention for youth with ASD. Results indicated that the family class demonstrated high feasibility, especially compared to the child-only class which failed to meet the attendance ($\geq 70\%$ of classes) and attrition ($\leq 15\%$ of participants) benchmarks. The family class had a higher attendance rate (88% vs 66%) and lower attrition rate (10% vs 20%) compared to the child-only class. Additionally, the class instructors reported greater progression in the family class compared to the child-only class, noting that parents were able to model techniques or provide support for their child. Parents of children from both classes provided positive feedback regarding their child's experience in the class, however, parents from the family class commented on improved social interactions while parents of children in the child-only class mainly commented on improvements in their child's physical abilities. Limitations of this study included the small sample size of both the family ($n = 9$ families) and child-only class ($n = 8$ children) and the lack of random assignment into the family or child-only class. The addition of parents or caregivers may allow for such programs to include youth with severe ASD behaviors who may require one-on-one support. Future studies should examine the efficacy of a family-based judo program on both parent and child physical and psychosocial health outcomes.

Declarations

Disclosure of potential conflicts of interest

The authors declare that they have no conflict of interest.

Research involving Human Participants and/or animals

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

This article does not contain any studies with animals performed by any of the authors

Informed consent

Informed consent was obtained from all individual participants included in the study

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Author Contributions

J.G. wrote the main manuscript text. C.P. and M.M. were in charge of data collection. J.G., M.M., and K.L. carried out the data analysis. J.G., C.P., and K.L prepared the tables. K.B. and D.F. assisted with the write-up of the methods and results. All authors reviewed the manuscript.

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