



A Three-Year Practice-Based Mixed-Methods Feasibility Evaluation of a Community-Based Inclusive Physical Activity Program for Autistic Youth

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Abstract

Autistic children and adolescents often encounter social, sensory, and environmental barriers to participation in group-based physical activity. This study evaluated the feasibility, safety, and participation-related processes of a community-based inclusive physical activity program in Germany that used adapted rugby-derived drills rather than competitive match play. The program was delivered through a coach-occupational therapist tandem model designed to individualize task demands, regulate sensory load, and support participation in real time. From December 2022 to June 2025, 12 autistic participants were enrolled, with 10 contributing complete longitudinal participation data. Across the evaluation period, 116 weekly sessions were delivered. In a practice-based mixed-methods feasibility design, parent interviews, early thesis-based and practice documentation, informal participant feedback, team reflection, and a prospective incident log were synthesised. Descriptive synthesis suggested improvements in social initiative, cooperation, self-confidence, and in-session regulation within a sustained group setting. Qualitative findings indicated that predictable routines, graded physical contact, and trust-based team interaction were perceived as supportive for engagement, continued attendance, and meaningful participation. Parents also described perceived changes beyond the training setting, including greater openness to social interaction and improved self-regulation in everyday contexts. No adverse incidents were recorded. Because of the small sample, lack of a control group, non-validated practice-based documentation, absence of formal interobserver reliability assessment, and lack of standardized direct youth acceptability measures, findings should be interpreted cautiously. Nevertheless, the study provides practice-based evidence that a structured, community-based program may be a feasible and safe participation-supporting option for autistic youth.

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Autistic children and adolescents often experience substantial barriers to participation in group-based physical activity and community sport. Difficulties with sensory modulation, motor coordination, social communication, and environmental demands can restrict access to organised movement settings even when interest in participation is present (Ben-Sasson et al., 2009; MacDonald et al., 2013; Must et al., 2015; Tomchek & Dunn, 2007). Reduced access to regular shared physical activity may also limit opportunities to build confidence, practice cooperation, and establish routines of community participation during childhood and adolescence (Shattuck et al., 2011).

Sport can, however, serve as more than a fitness context. In structured group settings, it may function as a vehicle for belonging, rule-based interaction, shared attention, and the gradual development of social initiative. Reviews of exercise and physical activity interventions in autism suggest potential benefits for behavioral, social, and health-related outcomes, but also underline marked heterogeneity in program design, outcome selection, and adaptation strategies (Bremer et al., 2016; Healy et al., 2018; Liang et al., 2022). Recent work has further emphasised that autistic youths' motivation to participate depends strongly on whether activities feel meaningful, predictable, socially safe, and responsive to individual needs (Wong et al., 2024).

Much of the existing literature has focused on short-term, non-contact, or individually delivered programs. Less is known about longer-term community-based sport participation in which social interaction, cooperation, and managed physical proximity are integral to the activity itself. This is an important gap because everyday participation in community sport rarely occurs in highly protected one-to-one contexts; rather, it requires children to engage with peers, routines, changing movement demands, and shared social expectations over time. European survey work further suggests that access to community sport for autistic individuals depends not only on individual ability but also on environmental adaptation, coach preparedness, and family confidence in the setting (Ruffino et al., 2025).

In the local practice context in which the program was developed, no explicit community-based sport offer for autistic children and adolescents was known to the initiating team. Families therefore typically had to rely on existing mainstream sport groups, provided that participation was tolerated by the child and accepted by the coaching environment. According to informal reports from families before program entry, some children had previously tried regular sport activities but were only partially included, for example by joining the warm-up while spending the main part of training on the side-line. This local participation gap was an important practical motivation for developing a protected, autism-responsive sport setting that still preserved the core features of authentic group-based physical activity.

Repeated routines are particularly relevant in this context. In group programs, opening circles, shared warm-ups, and consistent closing formats can function as participation-supporting rituals: they mark transitions, reduce uncertainty, and help children anticipate both social and sensory demands. Such rituals may therefore

provide an important bridge between behavioral predictability and social belonging within physical activity settings.

Against this background, rugby-derived training offers an intriguing but underexplored context. In its adapted form, rugby can provide clear rules, repeated routines, visible roles, cooperative team tasks, and graded opportunities for physical contact. These elements may be relevant for autistic youth because predictable rituals can reduce uncertainty, while structured drills involving passing, coordinated movement, and carefully dosed body contact may support motor planning, force modulation, and tolerance of proximity within a meaningful social framework. Importantly, the present program did not involve competitive match play; instead, it used selected rugby-derived drills that were modified to prioritise safety, predictability, and participation. The intention was not to claim rugby as uniquely effective, but to examine whether rugby-derived task structures could serve as an accessible vehicle for sustained group-based physical activity.

A further innovation of the program was its tandem delivery model, in which a rugby instructor/coach and occupational therapists worked together during every session. In the German context, this embedded therapist role enabled real-time adaptation of task demands, sensory load, and communication support without removing the children from the sporting situation. The model therefore combined sport-specific authenticity with therapeutic scaffolding and created a setting in which participation-related changes could be observed longitudinally in a community environment.

Because participation gains in such programs may not be fully captured by session-level observation alone, parent perspectives are also important. Parents can report whether changes perceived during training are reflected in everyday routines, emotional regulation, willingness to engage with others, and broader family participation. A mixed-methods approach that combines therapist observations with parent interviews is therefore useful for examining both in-session trajectories and parent-reported lived experiences of participation beyond the training context.

The present study reports a three-year practice-based mixed-methods feasibility evaluation of a community-based inclusive physical activity program for autistic youth in Germany. The aim was to describe participation-related processes observed in a sustained community-based physical activity setting, to document feasibility and safety, and to explore how parents and the training team perceived the role of structured routines, graded contact, and team-based interaction in supporting engagement over time.

Methods

Design

This study followed a practice-based mixed-methods feasibility design combining qualitative practice documentation, parent interviews, embedded participant feedback, and descriptive feasibility and safety data. The design aimed to capture participation-related processes, acceptability indicators, feasibility, and safety within an ongoing real-world community sport program.

Because the program was primarily established as a community-based training group rather than as a formal intervention trial, documentation practices combined structured early observation, field-note synthesis, parent interviews, informal participant feedback, team reflection, and prospective incident monitoring rather than a complete longitudinal quantitative outcome protocol.

The qualitative components of the study were designed, documented and reported with reference to established qualitative research quality criteria. In particular, the Consolidated Criteria for Reporting Qualitative Research (COREQ) (Tong et al., 2007) were used as an orienting framework to enhance transparency, reflexivity and methodological rigor across data collection, analysis and reporting.

Setting and Program Structure

The inclusive rugby group was founded by *charity Herzschräger e.V. in Hannover, Germany*. Weekly training sessions (approximately 60 min) took place outdoors from spring to autumn and in a gymnasium during the winter months. The initiative was conceived in November 2022, and regular weekly sessions commenced in December 2022.

The session structure remained stable across the program and is summarised in Table 1. The program did not aim to teach or play full rugby matches. Because match play involves complex, rapidly changing rules and the group included participants with a wide range of abilities and support needs, the intervention remained focused on adapted rugby-inspired drills rather than full match situations. Exercises were intentionally simplified, introduced incrementally (e.g., “one rule at a time”), supported by demonstration and visual/verbal cues, and adapted so that all participants could train at an individually appropriate level, including optional non-contact alternatives. Competitive rugby elements such as scrums, rucks/mauls, line-outs and full-contact match play were not part of the program. One participant later transitioned from the group into regular youth rugby training; this was interpreted as an individual participation pathway rather than as a representative outcome of the program. Participants could leave an exercise at any time and withdraw to a protected area on the field or in the gymnasium, or to an accompanying parent or caregiver when present. Returning to the training activity was possible at any time, and this withdrawal-and-return option was treated as an intentional participation-supportive adaptation rather than as non-compliance.

Exercise difficulty was adapted individually rather than progressed uniformly across the whole group. The aim was to ensure that all participants were challenged within each activity while still being able to complete the task with a positive sense of achievement. Because participants differed substantially in their baseline abilities and developmental trajectories, progression varied between individuals. For some participants, exercises became increasingly complex, cooperative, physically demanding, and contact-oriented over time, whereas others continued to use simplified or non-contact alternatives. New and more complex exercises were introduced only when they could be adapted so that all participants were able to take part at an individually appropriate level.

Table 1 Typical structure and content of the weekly training sessions

Session phase	Approx. duration	Typical content	Function and adaptations
Arrival and opening circle	Approx. 5 min	Participants arrive, meet in a circle, discuss the planned session, and may indicate preferred activities.	Provides a predictable transition into the group setting; allows participant choice and immediate adaptation to group size, weather, seasonal circumstances, and individual needs.
Circle-based passing drills	Approx. 5–10 min	Simple passing exercises in a circle using rugby balls and clear turn-taking routines.	Supports shared attention, coordination, communication, and warm-up within a stable, low-complexity format.
Preferred activity or running game	Approx. 15 min	A participant-requested activity or play-based running game. Activities regularly included cooperative and competitive elements as well as endurance-related movement.	Maintains motivation and engagement while preserving predictable session structure; tasks can be simplified, repeated, or modified according to the group.
Graded contact training	Approx. 15–20 min	One or two contact-related exercises, such as tackling a tackle bag or running into contact with a contact shield. In later sessions, some participants voluntarily tackled instructors in closely supervised drills.	Provides graded exposure to physical proximity and contact, with contact intensity individually adjusted. Non-contact alternatives were available, head contact was prohibited, and safe body positioning was coached throughout.
Feedback circle	Approx. 5 min	Participants indicate what they liked or disliked about the session, verbally or through gesture.	Offers a low-burden form of direct participant feedback and supports adaptation of future sessions without requiring formal child interviews.
Closing ritual and farewell	Approx. 5 min	The group ends with a consistent farewell ritual and the group chant “1, 2, 3, Gorilla”.	Creates closure, reinforces group identity, and supports predictability across sessions.

Contact progression followed a graded pathway and is summarised in Table 2. At every stage, participants could choose a non-tackling version of the task, such as pushing over the tackle bag, and contact intensity could be reduced or discontinued. Contact with instructors was introduced only for participants who explicitly chose this option and only in closely supervised drills.

Participant support and scaffolding were embedded in the session structure and are summarised in Table 3. Spatial supports were used to make waiting situations predictable and to reduce unintended physical contact. During indoor sessions, gymnastic hoops were used to create individual waiting spaces. During outdoor sessions, cones were placed at wide intervals, and participants moved forward from cone to cone until it was their turn. At the beginning of the program, marked temporary withdrawal zones were also available; these are no longer routinely needed in the current group, but protected withdrawal options remain available at any time. When exercise variations were introduced, the instructor demonstrated the task visually before participants attempted it.

A central social-safety strategy was the group’s “STOP” rule. All participants were taught that they could say “STOP” whenever another participant’s behaviour became overwhelming, whether because of physical proximity/contact or acoustic stimulation. When this occurred, the coaching or therapy team intervened immediately, clari-

Table 2 Graded progression of contact-related training tasks

Task area	Pro- gres- sion step	Typical activity	Safety/adaptation notes
Contact-shield work	1	Shoulder contact with a tackle/contact shield without active resistance.	Low-threshold introduction to physical contact; emphasis on body position and participant control.
Contact-shield work	2	Shoulder contact with a tackle/contact shield with resistance.	Resistance was adjusted to individual readiness and could be reduced at any time.
Contact-shield work	3	Breaking through two contact shields with resistance.	Used only when participants tolerated prior steps; task could be simplified or replaced.
Tackle-bag work	1	Pushing over a tackle bag in any preferred way.	Non-tackling entry option; success-oriented task completion.
Tackle-bag work	2	Running towards and pushing over a tackle bag.	Adds movement demand while retaining a non-tackling option.
Tackle-bag work	3	Tackling or pushing over a stationary or moving tackle bag from standing or from a run-up.	Participants could choose tackling or pushing; head contact was prohibited and safe body position was coached.
Instructor contact	Optional advanced step	For participants who explicitly chose this option, tackling an instructor instead of, or in addition to, a tackle bag.	Highly supervised, voluntary, and restricted to participants with sufficient readiness and motivation.

fied the situation, and supported the participants in re-establishing safe participation. Acoustic load in the gymnasium could not always be fully controlled, but the team repeatedly encouraged consideration for others and used individual conversations when shouting or other noise became difficult for peers. Environmental sounds on the rugby field were tolerated by the current group over time.

These strategies were intended to support autonomy rather than enforce a single correct performance standard. Participants were encouraged to complete each exercise in the way they felt able to attempt it. The coaching and therapy team intervened primarily when there was a risk of injury. Where participants were willing, the team guided them towards rugby-specific movement techniques; however, pushing over a tackle bag or pushing a contact shield with extended arms were treated as valid participation options.

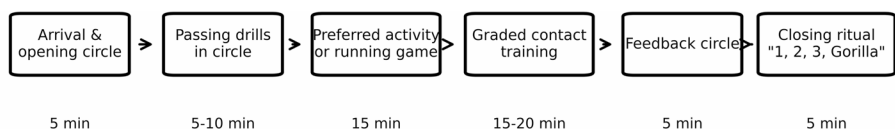
Between December 2022 and November 2024, a total of 88 training sessions were delivered during the funded phase. Across the full evaluation period (December 2022–June 2025), 116 training sessions were delivered; sessions were paused only during school holidays. Thus, the two totals refer to different observation windows: 88 sessions during the externally funded project period and 116 sessions across the complete evaluation period reported in this manuscript. For safe implementation, sessions were delivered with a minimum of four children present. Across the entire period, mean attendance was 8.9 participants per session, indicating stable participation and high feasibility of the community-based format.

The core session flow is shown in Fig. 1.

Attendance typically ranged between 7 and 10 participants per session (12 children were enrolled at baseline, with 10 providing complete longitudinal participation data). Sessions were conducted primarily with the enrolled autistic participants.

Table 3 Support, scaffolding, and sensory adaptation strategies used during training

Strategy	Implementation	Purpose	Current use/adaptation
Spatial organisation of waiting situations	Gymnastic hoops indoors; widely spaced cones outdoors; participants remained in their own space and moved forward when their turn approached.	Reduced unintended contact, supported predictability, and made personal space visible.	Available whenever needed; routinely embedded in indoor/outdoor organisation.
Marked withdrawal options	Temporary withdrawal zones were marked at the beginning of the program; participants could also withdraw to a protected area or to an accompanying parent/caregiver.	Supported self-regulation and safe temporary disengagement without leaving the program.	Marked zones are no longer routinely needed in the current group, but withdrawal and return remain possible at any time.
Visual modelling	The rugby instructor demonstrated exercise variations before participants attempted them.	Reduced verbal processing demands and supported understanding of movement tasks.	Used particularly when new or modified exercises were introduced.
STOP rule	Participants could say "STOP" when physical contact, proximity, noise, or another participant's behaviour became overwhelming.	Provided a simple shared signal for boundaries and co-regulation.	The team intervened, clarified the situation, and supported re-entry into the activity.
Acoustic and sensory load management	The team encouraged consideration for others and addressed shouting or excessive noise through individual conversations when needed.	Reduced sensory overload and supported group tolerance.	Environmental sounds on the rugby field were increasingly tolerated by participants over time.
Self-paced contact alternatives	Participants could push rather than tackle, use extended arms with a contact shield, reduce intensity, or choose non-contact versions.	Enabled participation without forcing body contact and protected positive task completion.	There was no "wrong" version of a task unless injury risk was present; rugby-specific technique was introduced only when accepted by the participant.



Core structure remains stable; content and support are adapted to attendance, weather, motivation, sensory load, and individual needs.

Fig. 1 Core session flow and adaptive support points

Parents often accompanied their children to training and remained available at the venue, but activities on the field or in the gymnasium were led by the rugby instructor and occupational therapists. This separation was intended to support the children's autonomous participation in a protected sport setting. Siblings occasionally joined individual sessions when they were curious about the activity, but this occurred only rarely across the evaluation period (approximately four to six sessions). The program was therefore maintained primarily as a participation space for autistic children and adolescents.

Training was conducted as one whole group rather than in separate subgroups. A typical session was led by one rugby instructor/coach together with occupational therapists. Across the evaluation period, three occupational therapists were involved in the team. Usually, one to two occupational therapists were active on the field, particularly when individual one-to-one support was needed. When all three occupational therapists were present, one could observe the session from the side-line.

Sessions were only conducted when at least two supporting adults were present, either the rugby instructor and one occupational therapist or two occupational therapists. When no rugby instructor was present and sessions were delivered by two occupational therapists, the activities were less rugby-specific. In addition, sessions took place only when at least four children had confirmed attendance.

Adverse events were prospectively monitored using a brief incident log completed by the coaching and therapy team immediately after each session. For this study, adverse events were defined as injuries requiring medical attention, session termination due to distress, or serious behavioral incidents (e.g., aggression or elopement).

Participants

Participants were children and adolescents aged 8–13 years at project start, all formally diagnosed with autism spectrum disorder according to ICD-10/DSM-5 criteria (American Psychiatric Association, 2013). The complete longitudinal sample ($n=10$) was approximately 10–16 years old at the end of the observation period (June 2025) and continued training throughout. Two of the 12 enrolled participants did not contribute complete longitudinal participation data because they permanently discontinued participation during the evaluation period. One participant left the program because the family moved away, and one participant discontinued participation because of health-related reasons unrelated to the training program. Both participants had attended approximately half of the documented training sessions before discontinuation. Importantly, neither withdrawal was preceded by an adverse event, injury, behavioral incident, or documented distress related to the intervention. Their available observational information was retained for descriptive qualitative synthesis where appropriate, but they were not included in the complete longitudinal participation sample.

Families were recruited through local autism networks and *autism counselling centre Hannover*.

Inclusion criteria comprised:

- Formal ASD diagnosis,
- Sufficient physical health for moderate physical activity,
- Ability to participate with support from parents and therapists.

Exclusion criteria included medical restrictions incompatible with graded contact drills or severe behavioral crises requiring one-to-one supervision.

Ethical Considerations

The study was conducted in accordance with the Declaration of Helsinki and approved by the local institutional ethics committee (*decision no. EB 1054/2023; date: 01.02.2023*).

Written informed consent was obtained from all parents or legal guardians for participation and for the use of anonymised data for research purposes. No photos or videos were recorded in this study. Where developmentally appropriate, children provided assent and were reminded that they could take breaks or withdraw at any time without consequences.

Given common concerns about injury risk in rugby, the program was designed to minimise head-injury risk through strict content boundaries and supervision. Tackling was practised only in isolated drills, primarily against a tackle bag and, for participants who voluntarily chose this option, with closely supervised instructor contact. Head contact was explicitly prohibited and safe body positioning was coached throughout. Contact intensity could be reduced, replaced by pushing-over tasks, or discontinued at any time. Any suspected injury or marked distress would have led to immediate cessation of participation and, where indicated, medical evaluation; adverse events were monitored prospectively via a session incident log. Eligibility screening and ongoing monitoring followed the exclusion criteria (e.g., medical restrictions incompatible with graded contact drills).

Data Collection and Analysis

Data sources comprised: (a) early thesis-based and practice documentation, including structured observation sheets, field notes, parent-survey material, and expert interviews generated mainly during the first program year; (b) semi-structured parent/legal-guardian interviews; (c) informal verbal or gestural participant feedback embedded in the closing circle of each session; (d) monthly team reflections; and (e) a prospective incident log completed across the full evaluation period.

During the early phase of the program, structured observation sheets were completed separately by members of the training team, including occupational therapists and the rugby instructor. These early observations focused on the development of individual participants and were discussed before subsequent sessions when clarification or adaptation was needed. Over time, systematic use of the structured sheets decreased and was not maintained continuously across the full three-year period. Consequently, these materials were treated as practice-based field documentation rather than as a complete longitudinal quantitative outcome dataset.

The parent/legal-guardian interview dataset ultimately comprised 10 interviews. Early data sources included two accompanying undergraduate theses (Siebert 2023a; Emmerich 2023b). One thesis contributed four parent interviews and two occupational therapist interviews focused on social interaction in three participating children (Emmerich 2023b). The remaining parent/legal-guardian interviews were conducted by the project team to complete the dataset. A second accompanying thesis contributed early parent-survey material and expert interviews focused on sensory integration, balance, proprioception, and motor development in the early phase of the

program (Siebert 2023a). Across the parent/legal-guardian interviews, interview duration was approximately 20–45 min and the interview guide covered participation in the group, communication, emotional regulation, sensory responses, and perceived transfer to home or school contexts. Probing questions were used to elicit concrete examples and changes over time rather than only global judgments.

Direct participant acceptability was addressed pragmatically within sessions through the closing feedback circle and through ongoing observation of voluntary engagement. Participants were invited to express verbally or through gestures what they had liked or disliked. No standardized child- or youth-reported acceptability measure was administered. This decision reflected the communication profiles and support needs of several participants and the practice-based character of the program; it is therefore treated as an important methodological limitation.

No formal interobserver agreement statistics, such as Cohen's kappa, intraclass correlation coefficients, or percentage agreement, were calculated. Similarly, no predefined reliability criterion was required before team members could contribute observations. The individuals contributing observations were also members of the intervention team. This dual role reflected the real-world practice-based nature of the program but may have introduced observer bias.

Approximately once per month, corresponding to every four training sessions, the team discussed training content, individual participant development, support needs, and the conduct of team members. These discussions informed ongoing adaptation of the program but were not documented as formal study meetings.

No formal fidelity checklist or manualised adherence assessment was used. The intervention included stable core components, including an opening circle, passing drills, participant-preferred or running-game activities, graded contact-related tasks, a feedback circle, and a closing ritual. However, sessions were deliberately adaptive rather than strictly manualised and were adjusted according to participant number, weather conditions, motivation, sensory load, support needs, and the activities that participants particularly enjoyed.

Qualitative material was analysed using a reflexive, team-based content analysis. Parent/legal-guardian interview transcripts, early field notes, thesis-based project documentation, and practice documentation were read repeatedly; meaning units related to participation, regulation, cooperation, contact tolerance, acceptability, and transfer were coded, compared across sources, and condensed into higher-order themes through iterative discussion within the research team. Simple descriptive counts from parent interviews were reported only where they were directly supported by the interview summaries. Incident-log data were summarised descriptively as safety outcomes.

The data sources, documentation level, and analytic use are summarised in Table 4.

Results

To strengthen triangulation, the results are organised around three analytic strands—social participation, sensory-motor regulation, and cross-context perceptions of change—while deliberately linking parent reports, early field notes, participant feed-

Table 4 Data sources, documentation level, and analytic use

Data source	Timing/coverage	Documentation procedure	Analytic use/limitation
Structured observation sheets and field notes	Mainly first program year	Completed separately by occupational therapists and rugby instructor during early phase; discussed before subsequent sessions when needed.	Practice-based developmental indicators; not treated as a complete longitudinal quantitative outcome dataset.
Accompanying undergraduate thesis documentation	Early program phase, 2023	One thesis documented parent/occupational-therapist interviews on social interaction; another documented parent-survey material and expert interviews on sensory integration and balance (Siebert 2023a; Emmerich 2023b).	Early project documentation; contextual practice-based material, not peer-reviewed external evidence.
Parent/legal-guardian interviews	Full parent dataset; $n=10$	Semi-structured interviews with parents/legal guardians; approximately 20–45 min; covered participation, communication, regulation, sensory responses, and transfer.	Primary qualitative source for perceived change and cross-context relevance; includes early parent-interview material from thesis documentation.
Participant feedback circles	Embedded in each session	Participants could indicate verbally or gesturally what they liked or disliked and suggest preferred activities.	Low-burden, informal acceptability indicator; not a standardized youth-reported outcome.
Team reflections	Approximately every four sessions/month	Training content, individual development, support needs, and team conduct were discussed.	Supported adaptation and interpretation; not documented as formal study meetings.
Prospective incident log	All delivered sessions, December 2022–June 2025	Adverse events were monitored using brief session-level incident documentation.	Descriptive safety monitoring across 116 delivered sessions.

back, team reflection, and safety documentation. Given the practice-based documentation, the results should be read as descriptive and hypothesis-generating rather than as longitudinal quantitative outcome evidence.

Social Interaction and Group Behavior

At program entry, several participants hesitated at the threshold of the group, avoided eye contact, or remained close to parents or therapists during transitions. Over time, a recurrent pattern across observations and parent reports was an increasing readiness to enter the group, orient to peers, and remain engaged within shared routines. The predictable arrival circle, repeated warm-up formats, and closing ritual appeared to provide a stable scaffold for this shift.

Across the observation period, field notes, team reflection, and parent reports described a gradual increase in spontaneous social initiative, defined as self-initiated approach or interaction. Participants more frequently addressed peers by name, joined paired or group tasks with less prompting, waited for turns, and responded to shared humour. Qualitative accounts suggested that these changes were experienced

not simply as compliance with rules but as growing comfort with team membership and shared activity.

Parents described this transition in relational terms: one parent noted that the child now ‘joins the group immediately and enjoys teamwork’, while another highlighted that the child had started ‘to address the other children on his own’. Taken together, the data suggest that social changes unfolded through repeated participation in shared routines rather than through isolated social-skills instruction.

Sensory Integration and Motor Development

Early field notes, practice documentation, and parent reports suggested gradual improvements in sensory regulation and coordinated movement. Changes were most often described in relation to proprioceptive and vestibular stability, which appeared relevant for calmer participation in drills involving movement transitions, catching and passing, and controlled body contact. Children who initially withdrew from rotational or balance-challenging tasks were increasingly described as able to remain oriented, recover after disequilibrium, and continue the activity.

A similar pattern was described for tactile tolerance and postural control. Rather than reflecting a global reduction of sensory differences, these observations indicate improved regulation within the bounded demands of the training context. Because structured observation sheets were not used continuously and no formal interobserver reliability was calculated, these findings are reported as practice-based qualitative indicators rather than as quantitative sensorimotor outcomes.

Parent and Therapist Feedback

Parent interviews, early field notes, participant feedback, and team reflection converged on three cross-cutting themes.

The embedded participant feedback circles provided an additional, low-burden indication of acceptability. Participants could express preferences, dislikes, or requests for future exercises verbally or through gesture. Contact-related activities were frequently requested as preferred exercises, and both children and parents often described enjoyment of these contact situations. This pattern was consistent with stable attendance across most participants and with parent reports that children looked forward to seeing other group members. Parents further reported that some children asked about absent peers, arranged contact outside training both online and in person, and invited one another to birthdays, which parents described as uncommon before participation in the program. These observations were not collected as formal outcome measures and should therefore be interpreted as contextual indicators of acceptability and social participation rather than as quantified effects.

These themes were visible both in qualitative statements and in descriptive parent-report counts. In the interview sample, 9 of 10 parents described their child as more open and communicative, 7 of 10 reported greater initiative in group situations, and 8 of 10 described improved emotional regulation. These counts are reported as descriptive summaries of parent interviews rather than as standardized outcome measures.

Table 5 Qualitative themes describing participation-related change

Theme	Main sources/examples	Descriptive finding	Interpretive note
Predictable routines and autonomous entry	Opening circle, repeated passing format, closing ritual	Parents and field notes described easier entry into the group and reduced reliance on caregivers over time.	Stable rituals appeared to reduce uncertainty and support participation.
Graded contact and proximity	Contact-shield drills, tackle-bag progression, optional instructor contact	Children increasingly chose contact-related tasks and recovered more quickly after mistakes or brief dysregulation.	Controlled contact may have supported confidence, proprioceptive input, and tolerance of proximity.
Social initiative and team identity	Group activities, feedback circle, group chant, peer interaction	Participants greeted peers, asked about absent children, used humour, and increasingly identified with the group.	Belonging and shared routines appeared central to engagement.
Perceived transfer beyond training	Parent interviews	Parents reported greater openness, communication, and emotional regulation in everyday contexts.	Transfer remains parent-reported and was not independently measured.

Table 6 Descriptive convergence between parent reports and practice observations

Domain	Parent-report summary	Practice-based observations	Interpretation/limitation
More open and communicative	9 of 10 parents	More frequent greeting, addressing peers, joining group activities	Consistent with increased comfort in the group setting.
Greater initiative in group situations	7 of 10 parents	Participants more often selected activities, joined tasks, or interacted without prompting	Suggests developing autonomy and social initiative.
Improved emotional regulation	8 of 10 parents	Faster recovery after mistakes, calmer responses during challenging drills	Parent-reported and practice-observed; not externally measured.
Enjoyment of contact-related tasks	Participant feedback and parent reports; not quantified formally	Wish exercises often came from the contact-training component	Indicates informal acceptability and motivation for graded contact.
Relationships beyond training	Parent reports; not quantified formally	Some children asked about absent peers, arranged contact outside training, or invited peers to birthdays	Suggests possible broader participation relevance; requires prospective study.

Practice observations and team reflections echoed these patterns across sessions, especially for team communication and social initiative.

Illustrative quotes underline the thematic pattern: ‘He now joins the group immediately and enjoys teamwork’; ‘She can now recover quickly after mistakes’; and ‘They greet each other, high-five and laugh together.’ These excerpts suggest that the perceived value of the program lay not only in isolated skill gains but in the combination of predictable structure, supported challenge, and positive group identity.

Tables 5 and 6 provide structured overviews of the qualitative themes and the descriptive convergence between parent reports, practice observations, participant

Table 7 Safety and Feasibility Indicators Across the Evaluation Period

Indicator	Definition	Observed count/status
Delivered sessions monitored	Training sessions delivered between December 2022 and June 2025	116 sessions
Injuries requiring medical attention	Any injury requiring external medical evaluation or treatment	0
Session termination due to distress	Training stopped for a participant because of marked distress	0
Serious behavioural incidents	Aggression or elopement requiring external intervention	0
Withdrawals due to training-related incident	Permanent discontinuation following injury, distress, or serious behavioural incident in training	0
Participant withdrawals	Two participants discontinued permanently because of relocation or health-related reasons unrelated to the intervention	2

feedback, and team reflection. They are intended as analytic summaries rather than stand-alone results and should be read alongside the narrative interpretation above.

A more detailed summary of perceived developmental changes as reported by both groups is presented in Table 6.

Feasibility and Safety

Feasibility and safety were monitored prospectively after each session using a brief incident log completed by the coaching and therapy team. Across the evaluation period (December 2022–June 2025; 116 delivered training sessions; sessions were paused only during school holidays), no adverse incidents were recorded (Table 7).

Specifically, there were no injuries requiring medical attention, no sessions terminated due to distress, and no safety-related behavioral incidents (e.g., aggression or elopement requiring external intervention) documented in the incident log.

Discussion

This practice-based mixed-methods feasibility evaluation suggests that an adapted rugby-derived program may offer a feasible and safe context for sustained group-based physical activity among autistic youth in a community setting. Across 116 sessions, parent interviews, early field notes, participant feedback, team reflection, and the incident log converged on participation-related changes and an absence of recorded adverse events. Because the sample was small, uncontrolled, and assessed with practice-based documentation rather than a complete longitudinal quantitative outcome protocol, these findings should be interpreted as descriptive and hypothesis-generating rather than as evidence of efficacy.

Addressing the question of why rugby, the answer lies in task characteristics rather than in the sport label itself. In this program, rugby-derived drills combined clear rules, repeated routines, visible team roles, cooperative demands, and carefully bounded physical contact. Competitive match play was not part of the intervention.

The relevance of rugby in this context therefore lies in its suitability as a structured vehicle for participation, not in a claim that it is superior to other sports.

Social Participation and Self-Confidence

Observed increases in spontaneous social initiative and team engagement suggest that stable routines and repeated cooperative drills may support participation in autistic youth. Consistent with prior work on social participation in autism (Shattuck et al., 2011; Deckers et al., 2017), several participants initially approached the group cautiously and relied heavily on parents or therapists. Over time, therapist and parent reports converged on more frequent joining of the group, greater turn-taking, and more confident interaction with peers.

At the same time, the present data do not justify strong claims about broader social-cognitive change. Improvements were most visible in observable behaviors within or around the training setting, whereas higher-order processes such as empathy or Theory of Mind were not directly assessed and should not be inferred from these findings.

Sensorimotor Integration and Emotional Regulation.

Practice-based observations and parent reports suggested gradual improvements in proprioceptive organisation, vestibular regulation, postural control, and tactile tolerance across participation in the program. In practical terms, children appeared increasingly able to tolerate proximity, recover after mistakes, and remain engaged in movement tasks that had initially been challenging. From a sensory-integration perspective, repeated and carefully dosed movement demands may have supported adaptive responses over time (Ayres, 1972). Because the observation procedures were not psychometrically validated, not maintained uniformly over all three years, and not supported by formal interobserver reliability statistics, these patterns should be read as descriptive indicators only.

It is plausible that predictable drill structure, graded movement demands, and carefully monitored contact supported self-regulation in the sessions. This interpretation is consistent with broader reviews linking exercise participation to behavioural and executive outcomes in autistic youth (Bremer et al., 2016; Liang et al., 2022), but the present design cannot establish mechanism or causality.

The Tandem Model of Coaching and Therapy

The coach–occupational therapist tandem model appears to have been a key implementation feature of the program. It allowed sport-specific tasks to be preserved while pace, communication, sensory load, and support could be adjusted in real time. In a community setting, this form of shared delivery may be especially relevant for children who need immediate co-regulation or graded task modification to remain engaged. It also aligns with broader calls for closer collaboration between sport and occupational therapy in participation-oriented settings (Bulan et al., 2025).

Parent-Reported Transfer Beyond the Sessions

Parents described changes that they perceived beyond the training sessions, including greater openness to peers, improved frustration tolerance, and more confidence in everyday movement situations. These reports are valuable because they address ecological relevance, but they remain informant-based and were not corroborated with standardised out-of-session measures. The longitudinal duration of the program may nevertheless have supported consolidation of participation-related gains over time.

In one illustrative case, long-term participation was followed by entry into a regular community rugby team without ongoing therapeutic support. This example should be interpreted as an individual pathway rather than a representative outcome, but it illustrates the type of participation transition that future research could examine more systematically.

Theoretical and Practical Implications

The findings are broadly compatible with participation-oriented frameworks such as the International Classification of Functioning, Disability and Health (ICF), in which functioning is shaped not only by individual characteristics but also by environmental supports and barriers (World Health Organization, 2001). More tentatively, they are also consistent with embodied perspectives that link movement experience and social engagement (Eigsti, 2013). In the present program, structured routines, adult scaffolding, and bounded task demands appeared to reduce barriers to engagement in community-based physical activity.

Implications for Practice

For practice, the potentially transferable element is not rugby alone, but the combination of predictable structure, graded challenge, coach preparedness, and real-time therapeutic support. In Germany, such program structures may also inform future inclusion-oriented coach education and broader sport development efforts, although these downstream applications were not examined in the present study. Replication in other clubs, sports, and regions is needed before broader claims about scalability can be made.

Limitations and Future Research

This study has several important limitations. The sample was small, there was no control group, and the quantitative component was limited to descriptive feasibility, safety, and parent-interview counts rather than standardized longitudinal outcome measures. Structured observation sheets were used mainly during the first program year and were not maintained continuously across the full evaluation period. No formal interobserver agreement statistics were calculated, no predefined reliability criterion was used for observers, and the individuals contributing observations were also members of the intervention team. This dual role reflects the real-world practice-based nature of the program but may have introduced observer bias. No for-

mal fidelity checklist was used; although sessions included stable core components, the intervention was intentionally adaptive rather than strictly manualised. Direct participant acceptability was assessed only informally through verbal or gestural feedback circles and observation of engagement, while standardized child- or youth-reported acceptability measures were not used. Parent interviews added an ecologically meaningful perspective, but they also reflect informant perceptions rather than independent verification of change. In addition, participants differed in baseline profiles, concurrent therapies and developmental changes outside the program were not controlled, and physical activity dose, intensity, and sedentary behavior were not measured directly.

Future research should therefore use larger samples, standardised measures of participation, sensory-motor functioning, acceptability, and physical activity, and comparative or controlled designs where feasible. Future studies should also include direct youth-reported or developmentally adapted acceptability measures, prospective fidelity monitoring using a core-component checklist, documented training procedures for observers, and formal interobserver reliability assessment. It would also be valuable to examine whether similar participation-related processes emerge in other inclusive sport contexts and to test the specific contribution of the coach-occupational therapist tandem delivery model more directly.

Conclusions

This three-year practice-based mixed-methods evaluation suggests that an adapted rugby-derived program can be organised as a feasible and safe form of inclusive group-based physical activity for autistic youth in a real-world community setting. The most plausible contribution of the program lies not in rugby-specific performance, but in the use of clear routines, cooperative drills, graded physical contact, informal participant feedback, and a coach-occupational therapist tandem model to support participation.

Given the small sample, uncontrolled design, non-standardized practice-based documentation, lack of formal fidelity and interobserver reliability assessment, and absence of standardized youth-reported acceptability measures, the findings should be read as descriptive and hypothesis-generating. Even so, they support further controlled research on how structured community sport may widen access to sustained physical activity for autistic youth.

Author Contributions TCW led the conceptualization of the study, coordinated the project, served as corresponding author, and prepared the first full draft of the manuscript. MS and ME were primarily responsible for data collection. CE, LAH, PW, CH, and ADJ contributed to the development of the study, interpretation of the findings, and critical revision of the manuscript for important intellectual content. CD provided senior supervision of the work and contributed to the interpretation and critical revision of the manuscript. All authors reviewed, revised, and approved the final manuscript.

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Data Availability The datasets generated and/or analyzed during the current study are not publicly available because they concern minor participants and include qualitative interview material that may contain potentially identifiable information, but they are available from the corresponding author on reasonable request, subject to ethical and data protection restrictions.

Declarations

Competing interests The authors declare no competing interests.

Ethical Approval The study was conducted in accordance with the Declaration of Helsinki and approved by the local institutional ethics committee (decision no. EB 1054/2023; date: 01.02.2023).

Informed Consent Written informed consent was obtained from all parents or legal guardians for participation and for the use of anonymised data for research purposes.

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