

Pickleball Participation Among Children in Mumbai, Pune, and Satara: A Cross-Sectional Study of Patterns and Physical Performance

Kamala K^{1*}, Anandan Duraisamy², Arunachalam Ramachandran³, Rajiv Balan⁴

¹Faculty of Physiotherapy, Madhav University, Pindwara (Sirohi), Rajasthan 307032, India

ORCID: 0009-0008-7272-4960

Email: kamrajiv@gmail.com

²Faculty of Physiotherapy, Madhav University, Pindwara (Sirohi), Rajasthan 307032, India

ORCID: 0009-0005-5204-2733

Email: anandmptneuro@gmail.com

³Faculty of Physiotherapy, Madhav University, Pindwara (Sirohi), Rajasthan 307032, India

ORCID: 0000-0001-8082-7195

Email: arunachalamphysio@gmail.com

⁴Faculty of Pediatrics, Holy Spirit Hospital, Andheri (E), Mumbai, Maharashtra 400093, India

ORCID: 0009-0003-8828-8300

Email: balanrajiv@gmail.com

***Corresponding Author:** Kamala K, Faculty of Physiotherapy, Madhav University, Pindwara (Sirohi), Rajasthan 307032, India

Email: kamrajiv@gmail.com

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ABSTRACT

Background:

Pickleball is a paddle sport that adopts elements from tennis, badminton, and table tennis. It has spread rapidly across Indian cities in recent years, yet little is documented about how children are taking to the game or how playing it relates to their physical performance.

Objective:

This study aimed to describe participation patterns and physical performance among child pickleball players drawn from clubs in Mumbai, Pune, and Satara.

Methods:

A cross-sectional study was carried out among 210 children aged 8 to 14 years, recruited through convenience sampling from 12 pickleball clubs and academies across the three cities. Participation history was recorded using a structured questionnaire, and physical performance was measured using the 5-metre sprint, the 20-metre sprint, a 90-degree change-of-direction test, and a simplified visual reaction-time task.

Results:

Most children had taken up pickleball within the previous two years, chiefly through introduction at school or a local club rather than through family. Boys reported marginally more weekly playing sessions than girls. Physical performance improved with both age and years of pickleball exposure, and children training more than three times a week performed better on the change-of-direction and reaction-time measures than less frequent players.

Conclusion:

Pickleball participation among children in these three Maharashtra cities appears to be growing, and more frequent play is associated with a favourable physical performance profile. Because the design is cross-sectional, causation cannot be established. Larger, prospective, multi-city studies are recommended to confirm these findings and to inform school and community sport policy.

Keywords: pickleball; children; physical activity; cross-sectional study; physical performance; youth sport

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INTRODUCTION

Pickleball is no longer considered a pastime play currently. Combining the court dimensions of badminton, the paddle-and-ball mechanics of table tennis, and some of the strategic patience of tennis, it has become one of the fastest-expanding racquet sports in the world¹. Its appeal lies in a short learning curve, a smaller playing area, and rules simple enough for a child to grasp within a few sessions. What began as a recreational activity for older adults has, over the past decade, drawn in a much wider age range. Paddle-sport clubs across urban India have started to see children as young as eight taking part in the sports.

There are many health benefits associated with this game similar to other sports. A recent scoping review found that adult pickleball players consistently report improvements in cardiovascular fitness, balance, and psychosocial wellbeing after taking up the sport². Motivational research backs this up: players tend to describe the game as intrinsically satisfying, driven more by a sense of mastery than by competitive ego, which may make it easier to sustain participation over time compared with sports built around constant ranking and comparison³. Wearable-device studies have also shown that a single recreational session can produce well over an hour of moderate-to-vigorous physical activity, along with a meaningful rise in heart rate and step count⁴. A broader systematic review of padel and pickleball together concluded that regular play is linked to greater life satisfaction and lower depressive symptoms, particularly among adult and older populations⁵. Whether these same benefits extend downward to school-going children, who have very different musculoskeletal and neuromuscular maturity, is a question the existing literature has barely touched. This gap matters because physical activity levels among Indian children are, by most accounts, significantly low. A comparative study across rural and urban parts of Western Maharashtra found that only a minority of adolescents met recommended activity thresholds, with screen time and academic pressure cited as major competing demands⁶. A separate investigation among school-going children in Punjab's Malwa region reported that both boys and girls showed a steady decline in moderate-to-vigorous activity as they grew older, with girls falling behind boys at every age band studied⁷. A multi-centre analysis spanning rural sites in India and Bangladesh

similarly found that active travel to school and structured leisure-time activity were far from universal, even in settings without the obvious urban barriers of traffic and limited open space⁸. Against this backdrop, any sport that children find genuinely enjoyable enough to return to voluntarily deserves closer scientific attention, since adherence, not theoretical benefit, is usually the harder problem in youth physical activity promotion. Despite pickleball's visible growth in Indian metropolitan and semi-urban centres, published data describing who is playing, how often, and with what physical consequence remain essentially absent for the paediatric age group. Existing assessment frameworks for youth physical activity emphasise the importance of standardised, well-validated measurement tools when comparing populations⁹, yet no study to date appears to have applied such tools specifically to child pickleball players in an Indian setting. Mumbai, Pune, and Satara were chosen for the present study because each city has, over the last three to four years, seen a marked increase in dedicated pickleball courts and junior coaching programmes, offering a natural, if informal, laboratory for observing an emerging youth sport in real time. The present study therefore aimed to describe participation patterns, including how and why children begin playing, how often they train, and for how long, and to relate these patterns to objectively measured physical performance across a battery of sprint, agility, and reaction-based field tests. There is also a practical, everyday reason to look closely at this particular sport rather than treating it as just another addition to the crowded menu of youth activities. Many Indian schools and residential societies already have badminton or tennis courts sitting underused for parts of the week, and a pickleball court can often be marked out on the same surface with minimal cost. This low infrastructure barrier, combined with equipment that is lighter and cheaper than a tennis racquet, may make the sport unusually easy to scale in settings where budgets for sports coaching are tight. Understanding whether this accessibility translates into genuine physical benefit for children, rather than simply more screen-free hours, is therefore not just an academic question but a practical one for school sports coordinators and municipal recreation departments alike.

METHODS

Study design

This was a cross-sectional, multi-city observational study. Reporting followed the STROBE (STrengthening the Reporting of OBservational studies in Epidemiology) statement for cross-sectional studies¹⁰. Ethical clearance was obtained from the Institutional Ethics Committee of Madhav University, Sirohi, Rajasthan, prior to any recruitment or data collection, and written informed consent was obtained from a parent or legal guardian of every participating child, with additional verbal assent taken from the children themselves.

Setting and participants

Data were collected between 07.06.2025 and 12.09.2026 at conveniently selected pickleball clubs and academies operating in Mumbai, Pune, and Satara. These three cities were chosen for practical accessibility and because each has an active, organised junior pickleball scene. Club coordinators in each city were approached first, and testing dates were fixed around their existing weekend coaching sessions so that ordinary training routines were not disrupted. Eligible participants were children aged 8 to 14 years who had been enrolled in structured pickleball coaching for at least one month at the time of testing. Children with a diagnosed musculoskeletal, cardiovascular, or neurological condition that could interfere with safe performance testing were excluded, as were those without complete parental consent documentation. Where more than one sibling from the same family attended a club, both were still eligible provided each met the inclusion criteria independently.

Sample size

The minimum required sample size was estimated using the standard prevalence-based formula for cross-sectional studies described by Charan and Biswas, assuming an expected proportion of 50% (to maximise the estimated variance in the absence of prior Indian data), a 95 % confidence level, and an absolute precision of 7%¹¹. This calculation yielded a minimum requirement of approximately 196 participants; allowing for an anticipated 10% rate of incomplete data, a target of 210 children was set, distributed as evenly as practicable across the three cities.

Outcome measures

Participation patterns were captured through a structured, interviewer-administered questionnaire covering age of first exposure to pickleball, mode of introduction (school, club, or family), current weekly training frequency, typical session duration, and whether play was purely recreational or included competitive tournaments. Anthropometric measurements included height, weight, and body mass index, classified against the WHO 2007 growth

reference for school-aged children and adolescents¹². Physical performance was assessed using a field-test battery adapted from established paediatric fitness assessment protocols, including the timed 5-metre and 20-metre linear sprint, referenced against normative values reported for comparable child populations¹³, and a 90-degree change-of-direction (COD90) agility test performed on a marked court. A brief visual reaction-time task, structurally simplified from the classic Eriksen flanker paradigm to suit a field setting, was additionally administered to capture a basic measure of stimulus-response speed relevant to the rapid net-play exchanges characteristic of pickleball¹⁴. The overall test sequencing and station-based administration approach drew on methods used in the Play Lifestyle and Activity in Youth study, which assessed multiple physical qualities in a single testing session for primary-school-aged children¹⁵.

Procedure and statistical analysis

All testing took place on a single day per club, following a standardised 10-minute dynamic warm-up supervised by a qualified physiotherapist or sports science graduate. Tests were administered in a fixed order to minimise fatigue-related bias, with at least two minutes of rest between maximal-effort trials. Data were entered into a spreadsheet and analysed using descriptive statistics (means, standard deviations, frequencies, and percentages) to characterise the sample. Independent-samples t-tests and one-way analysis of variance were used to compare performance across sex and age categories, and Pearson correlation coefficients were calculated to examine the relationship between years of pickleball exposure and each performance measure. Statistical significance was set at $p < 0.05$ throughout.

RESULTS

Table 1. Demographic and Anthropometric Characteristics of Study Participants (N = 210)

Characteristic	Mumbai (n=72)	Pune (n=70)	Satara (n=68)	Overall (N=210)
Age, years, mean $\pm$ SD	11.1 $\pm$ 1.5	10.6 $\pm$ 1.6	10.6 $\pm$ 1.7	10.8 $\pm$ 1.6
Boys, n (%)	39 (54.2)	38 (54.3)	37 (54.4)	114 (54.3)
Girls, n (%)	33 (45.8)	32 (45.7)	31 (45.6)	96 (45.7)
BMI-for-age – Thin, n (%)	6 (8.3)	7 (10.0)	6 (8.8)	19 (9.0)

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BMI-for-age – Normal, n (%)	58 (80.6)	55 (78.6)	54 (79.4)	167 (79.5)
BMI-for-age – Overweight, n (%)	8 (11.1)	8 (11.4)	8 (11.8)	24 (11.5)

BMI = body mass index, classified against the WHO 2007 growth reference for school-aged children and adolescents.

A total of 210 children completed testing, with roughly even representation from Mumbai (n = 72), Pune (n = 70), and Satara (n = 68). The mean age of the sample was 10.8 years (SD 1.6), and the group was fairly balanced by sex, with 114 boys and 96 girls. Mean BMI fell within the WHO-defined normal range for the majority of participants, with only a small proportion classified as thin or overweight for age. Club-wise, the Mumbai sample skewed slightly older on average than the Pune and Satara samples, which the club coordinators attributed to a longer-running junior programme in that city; this difference in mean age across cities was modest and did not appear to distort the overall performance trends described below.

Table 2. Participation Patterns Among Child Pickleball Players (N = 210)

Variable	Category	n (%) or Mean ± SD
Duration of participation	< 1 year	56 (26.7)
	1–2 years	78 (37.1)
	> 2 years	76 (36.2)
Mode of introduction	School	97 (46.2)
	Club/academy	76 (36.2)
	Family	37 (17.6)
Weekly training frequency	1–2 sessions	62 (29.5)
	3–4 sessions	105 (50.0)
	5–6 sessions	43 (20.5)
Mean sessions/week	Boys	3.4 ± 1.1

	Girls	2.9 ± 1.0
Tournament experience	Yes	41 (19.5)
	No	169 (80.5)

Percentages are column-wise within each variable; totals may not sum to exactly 100% due to rounding.

Regarding participation patterns, most children (around 64 percent) reported having started pickleball within the past two years, and school-based introduction was the most commonly cited entry point, ahead of club enrolment and family influence. Weekly training frequency ranged from one to six sessions, with a median of three sessions per week; boys reported a slightly higher average training frequency than girls, at 3.4 versus 2.9 sessions per week respectively, though this difference did not reach statistical significance (p = 0.09). A smaller subset of children, just under a fifth of the sample, had already competed in at least one organised tournament.

Table 3. Physical Performance Test Results by Sex and Weekly Training Frequency (Mean ± SD)

Test	Boys (n=114)	Girls (n=96)	≤2 sessions/wk (n=62)	≥3 sessions/wk (n=148)
5 m Sprint (s)	1.25 ± 0.13	1.32 ± 0.14	1.34 ± 0.15	1.26 ± 0.13
20 m Sprint (s)	4.29 ± 0.29	4.42 ± 0.32	4.48 ± 0.33	4.29 ± 0.29
COD90 (s)	7.5 ± 0.42	7.7 ± 0.47	7.9 ± 0.48	7.4 ± 0.41
Reaction time (ms)	612 ± 58	618 ± 61	624 ± 60	610 ± 58

COD90 = 90-degree change-of-direction test. The ≥3 sessions/week subgroup performed significantly better than the ≤2 sessions/week subgroup on the COD90 test (p = 0.02); other between-subgroup and between-sex differences were not all statistically significant and should be interpreted descriptively.

On the physical performance measures, older children consistently outperformed younger children across all tests, as would be expected given ongoing growth and neuromuscular maturation. The mean 5-metre sprint time was 1.28 seconds (SD 0.14) and the

mean 20-metre sprint time was 4.35 seconds (SD 0.31) across the full sample, with both measures improving steadily by age band. The COD90 agility test showed a similar pattern, with a mean completion time of 7.6 seconds (SD 0.45), and children who trained three or more times per week completed the test roughly half a second faster on average than those training twice a week or less ($p = 0.02$). Boys performed marginally faster on the sprint measures than girls, consistent with typical prepubertal sex differences in speed, though the gap narrowed on the reaction-time task, where performance was broadly similar between sexes.

A modest but statistically significant positive correlation was observed between years of pickleball exposure and change-of-direction performance ($r = 0.31$, $p = 0.01$), suggesting that longer-term engagement with the sport's characteristic movement demands, rapid lateral steps, split-step recovery, and short accelerations toward the non-volley zone, may be associated with better agility outcomes, though this cross-sectional design cannot confirm a causal training effect. No meaningful correlation emerged between years of exposure and reaction-time performance, which may reflect the smaller demand placed on pure visual processing speed relative to the game's more dominant footwork and coordination components.

DISCUSSION

The general pattern observed here, that more frequent pickleball play was associated with faster change-of-direction times, sits comfortably alongside a growing body of youth conditioning literature. Systematic reviews of speed-agility-quickness training in adolescent and young adult team-sport athletes report consistent, moderate-to-large improvements in change-of-direction speed and linear sprint performance following structured programmes¹⁶, and similar benefits have been documented specifically in adolescent soccer players undergoing SAQ-style conditioning¹⁷. Pickleball's own movement profile, short bursts of lateral shuffling, sudden deceleration at the non-volley zone line, and repeated split-step reactions, overlaps considerably with the demands targeted by these programmes, which may partly explain why children with greater cumulative exposure to the sport showed better agility scores in the present sample.

Comparable evidence comes from injury-prevention conditioning research in youth football. A randomised trial of the FIFA 11+ Kids warm-up programme found measurable improvements in dynamic postural control and sprint performance after just four weeks of structured neuromuscular training, delivered twice weekly¹⁸. This is a useful reference point for pickleball coaches in India, since a similarly brief, twice-weekly structured warm-up routine, rather than an entirely separate conditioning block, could

plausibly be layered onto existing junior coaching sessions without disrupting technical skill instruction. Small-sided games, a training modality already familiar to many youth sport coaches, offer a parallel avenue. Systematic reviews in youth basketball and broader team-sport settings report consistent gains in aerobic capacity, lower-limb power, and change-of-direction ability from small-sided games formats^{19,20}, and a further study combining small-sided games with dribbling-circuit drills found added benefit for both physical and technical outcomes in young soccer players²¹. Pickleball, being inherently a small-court, high-repetition game, may already function as an informal small-sided-games stimulus, which could partly account for the physical performance gradient seen with greater training frequency in this sample.

The cognitive dimension of the sport deserves comment as well, even though the present reaction-time findings were modest. Physical activity has a well-documented relationship with executive function in children, spanning inhibitory control, working memory, and cognitive flexibility, through mechanisms involving improved cerebral oxygenation and neuroplastic adaptation²³. A mediation analysis from Pakistan's PAK-IPPL cohort similarly found that cardiorespiratory fitness helped explain part of the link between physical activity and physical literacy in children of a comparable age range to the present sample²², while meta-analytic evidence indicates that cognitively engaging physical activity, activity that demands rapid decision-making rather than repetitive movement alone, produces somewhat larger executive-function benefits than simple aerobic exercise²⁴. Pickleball's constant tactical decision-making, where to place a return, whether to rush the net, how to read an opponent's paddle angle, arguably qualifies it as cognitively engaging in this sense, though further research using more sensitive executive-function measures than the simplified reaction-time task used here would be needed to confirm any specific cognitive advantage. Findings in younger children have shown that even brief daily bouts of physical activity can measurably shift executive-function subdomains²⁵, reinforcing the plausibility of a similar, if smaller, effect in slightly older pickleball-playing children.

Safety considerations cannot be ignored as participation expands. Injury surveillance among adult recreational players in South Korea found that just over a third had sustained at least one pickleball-related injury in the preceding year, with knee, elbow, and shoulder complaints predominating and overuse mechanisms accounting for the majority of cases²⁶. A larger, multi-tournament follow-up study in the same country reported a broadly similar overall injury prevalence, with lower-extremity and overuse injuries

again dominating the picture, and greater weekly playing volume emerging as an independent risk factor²⁷. Hospital-based data from the United States have documented a sharp rise in pickleball-related injuries and hospitalisations coinciding with the sport's broader popularity surge²⁸. Hip abductor weakness has also been specifically linked to poorer change-of-direction performance and a higher self-reported fall history among recreational players, underscoring the biomechanical importance of adequate hip and pelvic stability for the sport's characteristic lateral and multidirectional movements²⁹. Although this existing injury literature is drawn almost entirely from adult populations, the underlying biomechanical demands, rapid deceleration, unilateral loading, and repetitive lateral stepping, are not fundamentally different for children, and a paediatric-specific injury surveillance effort in Indian pickleball settings would be a valuable next step, ideally paired with the kind of structured neuromuscular warm-up protocols discussed above.

Sex-based performance differences observed in the present sample, with boys slightly ahead on raw sprint speed but a narrower gap on reaction time, echo patterns reported in adult competitive pickleball as well. An analysis of elite mixed-doubles matches found that male players tended to dominate shot-finishing statistics relative to female partners, particularly under neutral or losing match circumstances, suggesting that sex-based dynamics in the sport are not confined to youth or recreational levels alone³⁰. Whether such differences in a competitive, tactical context stem from underlying physical performance gaps, differential coaching exposure, or sport-specific socialisation patterns remains an open question that the present cross-sectional design cannot resolve.

For school sports coordinators and physiotherapists working with young athletes, the practical takeaway is fairly modest but still useful: a sport that is cheap to set up and easy for children to enjoy from the first session may, with regular enough exposure, contribute to the same kind of movement competence that more established youth conditioning programmes are designed to build. This does not mean pickleball should replace dedicated strength and conditioning work, particularly given the injury patterns discussed above, but it does suggest that schools looking for an accessible entry point into structured physical activity, especially for children who are put off by more traditional team sports, could reasonably consider it as a low-cost option worth piloting alongside proper warm-up and hip-stability screening.

Several limitations temper how far these findings can be generalised. The convenience sampling strategy, while practical given the informal

and still-developing structure of junior pickleball coaching in India, means the sample may not represent all child players across these three cities, and selection bias toward more engaged, better-resourced families attending organised clubs cannot be ruled out. Self-reported participation history is also subject to recall error, particularly among younger children. The cross-sectional design, by its nature, can identify associations but cannot establish whether pickleball training genuinely drives the physical performance gradient observed, or whether children who are already more physically capable simply gravitate toward more frequent play. Prospective, longitudinal designs, ideally incorporating a comparison group of age-matched non-players, would help disentangle this direction of effect.

CONCLUSION

This cross-sectional study offers an early descriptive picture of how child pickleball participation is unfolding across Mumbai, Pune, and Satara, and how it relates to basic measures of physical performance. Most children in the sample had taken up the sport recently, chiefly through school-based introduction, and those training more frequently tended to show better change-of-direction performance, in line with what youth conditioning research would predict from a sport built around rapid lateral movement. The findings should be read as preliminary rather than conclusive, given the convenience sampling and cross-sectional design, but they point toward pickleball as a sport worth further scientific attention as its popularity among Indian children continues to grow. Larger, longitudinal, and ideally multi-region studies, paired with structured injury surveillance, would help clarify both the physical and cognitive value of the sport for this age group, and would give coaches, physiotherapists, and school sport policymakers a firmer evidence base to work from.

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