

Validation of “Quick Reflex” a Mobile Application for Simple Response Time Assessment

A Cost-Effective and Reliable Alternative for Field Testing in Algerian Sports Science

Alioui Salahdine, Benrabeh Kheireddine, Bennadja Mohamed, Ouadeh Ahmed Elamine

¹Tisemsilt university (Algeria), Laboratory of Measurement and Evaluation for Physical and Sports Activities, salaheddine.alloui@univ-tisemsilt.dz

² Tisemsilt university (Algeria), benrabah.kheiredine@cuniv-tisemsilt.dz

³ Tisemsilt university (Algeria), bennadjam067@gmail.com

⁴Tisemsilt university, Laboratory of Multidisciplinary Research Program in Sports Science and Human Movement, University of Tisemsilt, Algeria

Received: 20/08 /2025 Accepted: 31/10 /2025 Published: 30/11 /2025

Abstract:

This study investigated the reliability and validity of the *Quick Reflex* Progressive Web Application for assessing Simple Response Time (SRT) in field-based sports science contexts. A repeated-measures design was applied to 20 male participants, divided into athletes (n=10) and non-athletes (n=10). Each participant completed both the Quick Reflex test, and the Ruler Drop Test (RDT) in two sessions separated by one week. Test-retest reliability was examined using intraclass correlation coefficients (ICC), while concurrent validity was assessed via Pearson correlations between the two tools, and construct validity through group comparisons. Results showed excellent test-retest reliability for Quick Reflex ($ICC \geq 0.92$) and only moderate reliability for the RDT ($ICC=0.68$). Strong correlations ($r \geq 0.81$, $p < 0.001$) supported concurrent validity, and athletes demonstrated significantly faster response times than non-athletes. The findings establish Quick Reflex as a reliable, valid, and low-cost alternative to the RDT in Algerian field settings

KEY WORDS: Simple Response Time; Reaction Time; Mobile Application; Validation; Ruler Drop Test; Sports Science.

المخلص: هدفت هذه الدراسة إلى فحص الصدق والثبات لتطبيق *Quick Reflex* في قياس زمن الاستجابة البسيط (SRT) في السياقات الميدانية لعلوم الرياضة. شملت العينة 20 مشاركاً ذكراً، قُسموا إلى رياضيين (10) وغير رياضيين (10)، خضعوا جميعاً لاختبار التطبيق واختبار سقوط المسطرة (RDT) في جلستين بفاصل أسبوع. تم تحليل الثبات باستخدام معامل الارتباط داخل المجموعات (ICC)، بينما تم تقييم الصدق التلازمي بمعاملات ارتباط بيرسون بين الأداتين، والصدق البنائي بمقارنة أداء المجموعتين. أظهرت النتائج ثباتاً ممتازاً لتطبيق Quick Reflex ($ICC \geq 0.92$) مقابل ثبات متوسط لاختبار المسطرة ($ICC=0.68$)، كما وُجدت علاقات ارتباط قوية ($r \geq 0.81$, $p < 0.001$) تدعم الصدق التلازمي، وسجل الرياضيون زمناً أسرع مقارنة بغير الرياضيين. تؤكد النتائج أن تطبيق Quick Reflex يمثل بديلاً موثقاً وصالحاً وذو تكلفة منخفضة لاختبار المسطرة في السياق الجزائري..

1. Introduction

Response time in sport is the total interval from stimulus onset to task completion, combining reaction time (from stimulus to movement initiation) and movement time (from initiation to the end of the action) (*Moisello et al., 2009; Wilkerson et al., 2024*).

As a fundamental psychomotor skill, rapid response capabilities underpin success across disciplines, from explosive block starts in sprinting to the split-second saves required of goalkeepers in football, where motor reaction and decision components critically influence outcomes (*Cano et al., 2024*).

Physiologically, performance reflects a sensorimotor circuit in which sensory inputs are transmitted to and processed within the central nervous system before descending motor commands drive the appropriate musculature (*Cano et al., 2025; Czyż, 2021*).

Empirical research consistently shows that trained competitors exhibit faster reaction times than noncompetitive peers, although absolute values depend on modality and task parameters, cautioning against universal fixed millisecond ranges (*Luu et al., 2021*)

In many field-based settings within developing sports science ecosystems, reaction time assessment is constrained by the cost and logistical complexity of laboratory-grade equipment, leading practitioners to adopt simple, low-cost methods such as the Ruler Drop Test (RDT) for Simple Reaction Time because of its minimal equipment and ease of use (*Del Rossi et al., 2014; Ferreira et al., 2024a*)

Despite its prevalence, the scientific validity and reliability of the RDT have shown inconsistent results; for example, recent work reported poor test–retest reliability for the simple RDT with ICC values as low as 0.57, whereas choice and dual-task variants showed moderate-to-good reliability and acceptable construct validity against the Deary–Liewald RT (*Ferreira et al., 2024a*). Such measurement error and known practice effects in repeated RDT administrations can mislead interpretation of athlete status and obscure training adaptations if not accounted for (*Del Rossi et al., 2014*)

The sports landscape in Algeria presents a unique and challenging environment. We're looking at a sector that is not only heavily dependent on public funding but is also wrestling with aging

infrastructure. To make matters more complex, investment is overwhelmingly concentrated on a few sports, most notably football. What does this all mean? It means access to high-end sports technology is scarce, forcing coaches and athletes to rely almost exclusively on low-cost alternatives.

Against this backdrop, the near-universal presence of smartphones offers a fascinating opportunity. Mobile health applications seem like a perfect, low-cost solution for collecting objective performance data right on the field. There's a catch, though. Before we can confidently use these tools for serious research or to inform decisions for elite athletes, they have to be put through their paces with rigorous validation to confirm their accuracy and reliability (*Harper et al., 2022; Makaracı et al., 2024*).

The "Quick Reflex" app was created to meet this very need. But let's be clear: without being properly tested against an established benchmark, its use in a scientific or high-performance setting is purely preliminary.

This brings us to the core problem this study aims to solve. The Algerian sports science community frequently uses the Ruler Drop Test (RDT), a tool with well-known reliability problems. This creates a very real need for a more trustworthy, yet equally accessible, method for measuring Simple Response Time (SRT). While 'Quick Reflex' looks promising, its scientific credibility is still an open question.

So, the central research question becomes this: Is the 'Quick Reflex' mobile application a reliable and valid tool for measuring Simple Response Time in field settings, making it a suitable replacement for the Ruler Drop Test in the Algerian context? To answer this, our study will test the following hypotheses:

1. The 'Quick Reflex' application will demonstrate good test-retest reliability ($ICC \geq 0.75$) for measuring SRT over a week interval.
2. SRT measurements from 'Quick Reflex' will show a strong, positive correlation ($r \geq 0.70$) with SRT measurements derived from the RDT, indicating strong concurrent validity.
3. The athlete group will exhibit significantly faster mean SRT than the non-athlete group when measured by both the 'Quick Reflex' app and the RDT, supporting the construct validity of the new tool.

2. General objective of the study

The primary objective of this study is to scientifically evaluate the psychometric properties of the 'Quick Reflex' PWA application by determining its test-retest reliability and its concurrent validity against the Ruler Drop Test for the assessment of Simple Response Time.

A secondary objective is to compare SRT performance between a cohort of trained athletes and non-athletes using both measurement tools to contribute to the construct validity of the application.

The scientific importance of this research lies in its contribution to the growing body of literature on the validation of mobile health (mHealth) applications in sports and exercise science. It addresses the critical need for evidence-based practice in the adoption of new technologies for human performance measurement, ensuring that such tools are both accurate and reliable.

The practical (applied) importance of this study is to provide the Algerian sports science community—including coaches, physical educators, and researchers at institutions with a validated, no-cost, and highly accessible tool. A positive outcome would empower practitioners to conduct more reliable field-based assessments, thereby improving athlete monitoring, talent identification, and the overall quality of regional sports science research without incurring financial barriers.

3. Procedural definition of the concepts mentioned in the research

The first concept: Simple Response Time (SRT)

The term "response" originates from Latin "respondere" meaning "to answer," and "time" comes from Old English "tīma," referring to a measurable period, while "Simple" is derived from Latin "simplex," meaning "single" or "uncomplicated," modifying the base meaning to denote a straightforward, single-step process.

It is defined as the minimal time needed for an individual to respond to a single stimulus with a simple, pre-determined motor action. It represents the efficiency of the nervous system in processing sensory information and executing responses. SRT is a fundamental measure of processing speed important in sports and motor control. It involves detecting the stimulus, processing it, and generating an immediate motor response without the complexity of selecting between multiple

possible responses (*Pojksic et al., 2019; Woods et al., 2015*)

The second concept: Reaction Time (RT) vs. Response Time (RT)

While often used interchangeably, the terms "reaction time" and "response time" refer to distinct temporal components of a motor action. For the purpose of this study, a clear distinction is made based on established literature.

Reaction Time: the interval from stimulus presentation to the initiation of movement (pre-motor + motor onset), i.e., time to perceive, process, and start responding. (*Noorani & Carpenter, 2016*)

Response Time: the total time from stimulus presentation to completion of the movement, i.e., Reaction Time + Movement Time (from movement onset to movement end). (*Pojksic et al., 2019*)

In sport science, reaction time assesses perceptual–decision speed, while response time captures the full functional performance of detecting a cue and finishing the action (e.g., spotting and catching a ball).

Quick Reflex application is designed to measure both components, allowing for a more granular analysis of performance.

The third concept: Reliability and Validity

Validity: The extent to which a test measures exactly what it is intended to measure in sport/fitness contexts (*Currell & Jeukendrup, 2008*).

Implication: High validity ensures results meaningfully reflect the targeted performance or attribute

In this investigation, the widely used RDT serves as the criterion measure to establish the concurrent validity of the Quick Reflex application.

Reliability: The consistency or repeatability of measurements—producing similar results under similar conditions over time (*Currell & Jeukendrup, 2008*)

Reliability is necessary for validity; without dependable scores, validity cannot be established

In this study, it is quantified using the Intraclass Correlation Coefficient (ICC) and is a critical measure of the instrument's dependability for longitudinal monitoring.

4. The methodological procedures used in the study

4-1 Method and tools

Approach used: a quantitative, comparative, repeated-measures (test-

retest) research design was employed to systematically assess the reliability and validity of the Quick Reflex PWA mobile application.

Sample and methods of selection: For this study, we recruited a total of 20 healthy volunteers, drawing from a convenience sample of individuals at the local AFFAK ELBAYADH volleyball club and the university. Before anything began, we made sure every participant provided their full consent and was committed to the process.

To get to the question of construct validity, we intentionally split our sample into two very different groups. The thinking here was to create a clear comparison between individuals with and without a background in structured athletic training.

- **Athlete Group (n=10):** This group was made up of male volleyball players (aged 25-30) from the AFFAK ELBAYADH club. To be included, they had to be active competitors with a consistent training schedule, meaning at least three sessions a week for the last two years.
- **Non-Athlete Group (n=10):** This group consisted of male university students from the same age bracket. The key difference was their lack of regular, structured training; our main inclusion criterion for this group was engaging in less than one hour of vigorous physical activity per week.

As shown in Table 1, we compared the demographic details of both groups. It was important to find that there were no statistically significant differences in age and height. This gives us confidence that these factors did not act as confounding variables in our findings.

Table N°1: Participant Demographics (Mean ± SD)

Group	n	Age (years)	Height (cm)
Athletes	10	25.5±1.8	178.4±8.2
Non-Athletes	10	24.1±2.1	177.9±7.6
Source: The authors (2025).			

Tool/Tools:

Two instruments were used to measure Simple Response Time:

1. **Quick Reflex PWA Mobile Application (Version 2.0):** This is a scientific tool for SRT assessment developed as an open-source project (https://github.com/Salahalioui/QuickReflex_V2) the app is a Progressive Web App (PWA) designed for measuring and training Simple reaction time in athletes, coaches, and researchers. Built with modern web technologies, Quick Reflex provides performance measurement across multiple cognitive test modules with comprehensive Movement Initiation Time (MIT) integration.
2. To ensure consistency, the application was installed on a single, standardized smartphone model (Samsung Galaxy S21 5G, Android 11, 120 HZ Refresh rate Screen, 240 sampling rate) used for all testing sessions. The application functions by presenting a simple visual stimulus (a Red circle appear in the screen) , The participant is instructed to tap the screen as quickly as possible upon seeing the red circle. The application's algorithm calculates and records two key metrics in milliseconds (ms):
 - **Simple Response Time (SRT -corrected):** The time from stimulus appearance to the finger making initial contact with the screen and offset by the calibration Results (Device Calibration)
 - **Reaction Time (RT):** The time from stimulus appearance to initial finger movement which is calculated by (SRT -corrected -MIT), where MIT is the movement Time of the finger tapping the screen measured via MIT module in the app.
3. **Ruler Drop Test (RDT):** A standard 1-meter rigid ruler with millimeter markings was used. A standardized protocol, synthesized from best practices in literature to maximize reliability, was implemented. The participant was seated comfortably in a chair with their dominant forearm resting on a table edge, allowing their hand and fingers to be suspended. The tester held the ruler vertically, aligning the '0 cm' mark with the top of the participant's open thumb and index finger, ensuring no physical contact was made. The tester released the ruler at a self-generated random interval between 2 and 5 seconds to prevent anticipation. The participant was instructed to catch the ruler as quickly as possible. The distance the ruler fell was measured in meters (m) from the top of the participant's thumb. This distance

(d) was then converted into SRT in seconds (t) using the established formula for a falling body under gravitational acceleration ($g=9.81\text{m/s}^2$): $t=2d/g$. (MACKENZIE, B., 2004)

Research / study procedures

Each participant completed two identical testing sessions (Trial 1 and Trial 2), separated by a period of 1 week to assess test-retest reliability. All sessions were conducted at the same time of day to minimize diurnal variation. Within each session, participants performed both the Quick Reflex test and the RDT. To control potential order effects, the sequence of the two tests was counterbalanced across participants; half the participants in each group performed the app test first, while the other half performed the RDT first.

- **Quick Reflex Protocol (In the app):** Participants were seated and held the smartphone comfortably.

Experimental Parameters Used in the SRT Module:

Trial Structure:

- Practice Trials: 5 trials (familiarization phase)
- Test Trials: 20 trials (data collection phase)
- Total Duration: Approximately 3-5 minutes per session

Timing Specifications:

- Inter-Stimulus Interval (ISI): 1,500-4,000 ms (randomized)
- Stimulus Duration: Until response (no time limit)
- Response Window: Unlimited (participant-paced)

Stimulus Presentation

- Stimulus: Red circular target (100% saturation)
- Presentation: Central screen location
- Background: Neutral gray/white
- Size: Optimized for touch interface visibility

Response Collection

Input Method:

- Interface: Touch screen interaction
- Response: Tap anywhere on screen
- Sampling: Optimized touch event detection
- Precision: Performance.now() API (sub-millisecond accuracy)

Device Calibration:

$\text{deviceLatencyOffset} = (1000 / \text{refreshRate}) / 2 + (1000 / \text{touchSampling}) / 2$

correctedRT = rawRT - deviceLatencyOffset

Data Quality Control

Automatic Exclusions:

Anticipatory Responses: RT < 100 ms

- Rationale: Faster than neural transmission time
- Reference: Woodworth & Schlosberg (1954)

Delayed Responses: RT > 1,500 ms

- Rationale: Indicates inattention or task disengagement
- Applied after initial data collection

Practice Trials: Excluded from all analysis

- Used for familiarization only

Statistical Cleaning:

- Method Options: MAD, IQR, Percentage Trimming, or Standard Deviation ($\pm 2.5\sigma$)
- Minimum Valid Trials: 3 trials required for analysis
- Outlier Detection: Applied post-collection using researcher-selected method

Data Processing Pipeline

Movement Initiation Time (MIT) Correction:

- MIT Calibration: 30-tap finger tapping protocol
- MIT Calculation: Mean interval between taps
- RT Correction: $RT = (rawSRT - deviceOffset) - MIT$
- Reliability Check: ICC > 0.70 for MIT data inclusion

Output Measures:

- Mean SRT: Average of valid trials (device-corrected)
 - MIT-Corrected RT: Cognitive processing time only
 - Standard Deviation: Variability measure
 - Coefficient of Variation: Normalized variability
 - Valid Trial Count: Number of trials included in analysis
-
- **RDT Protocol:** To account for the known learning effect associated with the RDT, each participant first completed a practice session consisting of 5 drops. Following this, a 2-minute rest period was provided. The formal test then commenced, during which 15 trials were administered. The mean distance from these 15 trials was calculated and converted to time for the final analysis.

The scientific foundations of the tool: Statistical tools

All data were analyzed using IBM SPSS Statistics for Windows,

Version 28.0, The alpha level for determining statistical significance was set a priori at $p < 0.05$.

- **Descriptive Statistics:** Means and standard deviations (SD) were calculated for all dependent variables (SRTApp, RTApp, SRTRuler) for both groups across both trials.
- **Test-Retest Reliability:** Two-way mixed-effects, absolute agreement, single-rater Intraclass Coefficient (ICC3,1) with 95% confidence intervals (CI) was calculated to determine the reliability of each measure between Trial 1 and Trial 2. ICC values were interpreted according to established guidelines: < 0.50 (poor), $0.50-0.75$ (moderate), $0.75-0.90$ (good), and > 0.90 (excellent).
- **Concurrent Validity:** The relationship between the SRT app results and SRT Ruler was assessed using Pearson's correlation coefficient (r).
- **Group Differences:** Independent samples t-tests were conducted to compare the mean SRT and RT scores between the athlete and non-athlete groups for each measurement tool.

4-2 Presentation and Analysis of Results

The results of the statistical analyses are presented quantitatively in the following tables. This section provides a direct report of the findings according to the study's methodological procedures.

Table No2: Descriptive Statistics and Test-Retest Reliability for Reaction Time Measures (Total Sample, N=20)

Measure	Trial 1 (Mean ± SD)	Trial 2 (Mean ± SD)	ICC3,1	95% Confidence Interval
RTApp (ms)	215.4±25.1	213.9±24.5	0.92	0.81, 0.97
SRTApp (ms)	288.7±30.3	286.5±29.8	0.94	0.85, 0.98
SRTRuler (ms)	231±28	225±26	0.68	0.35, 0.86
Source: The authors (2025).				

Table 2 presents test-retest reliability for all measures. The Quick Reflex application demonstrated excellent reliability for both SRTApp (ICC=0.92) and RTApp (ICC=0.94). The Ruler Drop Test (SRTRuler) demonstrated moderate reliability (ICC=0.68).

Table N°3: Concurrent Validity Between QuickReflex_V2 (SRTApp) and Ruler Drop Test (SRTRuler)

Trial	Pearson's Correlation (r)	p-value
Trial 1	0.81	<0.001
Trial 2	0.84	<0.001
Source: The authors (2025).		

Table 3 shows the results for concurrent validity. A strong, positive, and statistically significant correlation was found between SRTApp and SRTRuler in both Trial 1 (r=0.81, p<0.001) and Trial 2 (r=0.84, p<0.001).

Table N°4: Comparison of Performance Between Athlete and Non-Athlete Groups (Trial 1 Data)

Measure	Athlete Group (Mean ± SD)	Non-Athlete Group (Mean ± SD)	t-statistic	p-value
RTApp (ms)	198.2±18.5	232.6±21.3	-4.05	<0.001
SRTApp (ms)	269.1±22.4	308.3±25.0	-3.67	0.002
SRTRuler (s)	0.212±0.019	0.250±0.024	-3.81	0.001
Source: The authors (2025).				

Table 4 presents the comparison between the athlete and non-athlete groups. The athlete group demonstrated significantly faster times than

the non-athlete group on all measures: SRTApp ($p<0.001$), RTApp ($p=0.002$), and SRTRuler ($p=0.001$).

• 4-3 Discussion and interpretation of the results

The primary aim of this study was to evaluate the psychometric properties of the Quick Reflex application as a tool for assessing Simple Response Time. The findings strongly support the initial hypotheses, indicating that the application is both a reliable and valid instrument suitable for field-based use, particularly within the context of Algerian sports science.

The first major finding relates to the test-retest reliability of the application. The Quick Reflex demonstrated excellent reliability for both SRTApp ($ICC=0.92$) and RTApp ($ICC=0.94$) over a two-week interval. These values exceed the threshold for good reliability ($ICC>0.75$) and approach the benchmark for excellent reliability ($ICC>0.90$) (Qin *et al.*, 2019). in line with standard interpretive guidelines in reliability research and applied measurement reporting (Currell & Jeukendrup, 2008; Koo & Li, 2016)

This high degree of consistency is paramount for any assessment tool, as it ensures that observed changes in an athlete's score are likely due to genuine performance changes rather than measurement errors. The reliability of the app compares favorably with values reported for various computerized and clinical reaction time tests in the literature, which often show ICCs ranging from 0.51 to 0.90 depending on the specific test and retest interval (Jakorinne *et al.*, 2018; Pugh *et al.*, 2025). More importantly, the app's reliability stands in stark contrast to that of the RDT, which, within this same sample, demonstrated only moderate reliability ($ICC=0.68$). This finding is consistent with previous research that has reported poor to moderate reliability for the RDT, with ICC values around 0.57 (Ferreira *et al.*, 2024b). The superior consistency of the Quick Reflex application is the study's most significant practical outcome, as it establishes the tool not merely as an alternative, but as a methodologically more robust instrument than the current common practice.

The second hypothesis, concerning concurrent validity, was supported. Across two sessions, there was a strong, positive correlation between the app-based simple reaction time measure and the ruler drop test, consistent with prior evidence that mobile/app

reaction-time assessments can show substantial convergence with established reference measures (e.g., $r \approx 0.59$ against a computerized RT battery; higher correlations up to $r \approx 0.96$ in related mobile timing contexts) (Burghart *et al.*, 2019; Pumpho *et al.*, 2023). This pattern indicates that both instruments index the same underlying psychomotor construct of simple reaction time, aligning with standard practice for validating new field tools via concurrent correlations and agreement analyses (Burghart *et al.*, 2019).

However, interpretation requires nuance because the ruler drop test (RDT) is a common field method rather than a laboratory gold standard. Recent work on RDT shows that the simple RDT format can exhibit poor test–retest reliability ($ICC \approx 0.57$) (Ferreira *et al.*, 2024b), whereas certain modified RDT variants achieve moderate to good reliability, underscoring limitations in the basic field procedure. Therefore, a strong correlation with RDT demonstrates convergence with current field practice without implying that RDT is the definitive criterion. Given the app’s higher reliability profile typical of well-designed mobile assessments, positioning the app as a direct replacement offers a methodological advance for practitioners—preserving the same target attribute they already monitor while improving precision and confidence in longitudinal data.

Finally, the study's third hypothesis was confirmed, providing evidence for the construct validity of the Quick Reflex application. The athlete group performed significantly better, as they had faster Response times, and reaction times—than the non-athlete group on all measures. This finding aligns with a substantial body of research demonstrating that athletes, particularly those in sports requiring rapid decision-making and movement, possess superior reaction times compared to their non-athletic counterparts (Lesiakowski *et al.*, 2017; Luu *et al.*, 2021; Sharma *et al.*, 2019). The ability of the Quick Reflex app to successfully and significantly differentiate between these two known groups demonstrates its sensitivity to detect expected physiological and neuromuscular differences. This is a crucial aspect of construct validity, as it shows the tool measures a quality that is relevant to athletic training and performance.

The collective findings have profound implications for the Algerian sports science community. The Quick Reflex application directly addresses the prevalent challenges of limited funding and access to

specialized equipment. By providing a no-cost, highly accessible, and, most importantly, scientifically validated and reliable tool, this study empowers coaches, physical educators, and researchers across the country. Practitioners can now move beyond the methodologically flawed RDT and adopt a more precise instrument for talent identification, monitoring neuromuscular fatigue, and tracking athlete development over time without any financial investment. This can contribute to elevating the overall standard of scientific practice within Algerian sports.

Despite the strong and positive findings, this study has several limitations that should be acknowledged. The sample size was relatively small and was recruited via convenience sampling, which may limit the generalizability of the results to the broader population of Algerian athletes. The use of the RDT as the criterion measure, while pragmatic and relevant to the study's objective, means that concurrent validity was not established against a laboratory-based gold standard, such as a force plate or high-speed kinematic system.

Future research should aim to address these limitations by validating the Quick Reflex application against a true gold standard measure in a larger, more diverse sample of athletes from various sports. Longitudinal studies employing the app to track SRT changes across a competitive season would also provide valuable insights into its utility for monitoring training status and fatigue.

Conclusion

This study successfully validated the 'QuickReflex_V2' mobile application as a tool for assessing Simple Response Time. The findings demonstrate that the application possesses strong psychometric properties, including excellent test-retest reliability and strong concurrent validity against the commonly used Ruler Drop Test. Furthermore, the application proved sensitive enough to detect the expected superior performance of athletes compared to non-athletes, supporting its construct validity. The results clearly indicate that QuickReflex_V2 is not only a viable alternative to the RDT but a methodologically superior one, offering greater consistency and precision.

Based on these findings, the 'QuickReflex' application is highly recommended for adoption by coaches, physical educators, and sports scientists in Algeria and other regions with similar resource

constraints. Its implementation can significantly enhance the quality and reliability of field-based psychomotor assessment without incurring any financial cost, thereby fostering evidence-based practice in athlete development.

Future research prospects should focus on validating the application against laboratory-grade equipment to establish its criterion validity more definitively. Additionally, exploring its application in other areas of sports science, such as concussion management and the monitoring of neuromuscular fatigue, would further elucidate its potential as a versatile and valuable assessment tool.

• Citations

1. Burghart, M., Craig, J., Radel, J., & Huisinga, J. (2019). Reliability and validity of a motion-based reaction time assessment using a mobile device. *Applied Neuropsychology. Adult*, 26(6), 558–563. <https://doi.org/10.1080/23279095.2018.1469491>
2. Cano, L. A., Albarracín, A. L., Farfán, F. D., & Fernández, E. (2025). Brain-hemispheric differences in the premotor area for motor planning: An approach based on corticomuscular connectivity during motor decision-making. *NeuroImage*, 312, 121230. <https://doi.org/10.1016/j.neuroimage.2025.121230>
3. Cano, L. A., Gerez, G. D., García, M. S., Albarracín, A. L., Farfán, F. D., & Fernández-Jover, E. (2024). Decision-Making Time Analysis for Assessing Processing Speed in Athletes during Motor Reaction Tasks. *Sports (Basel, Switzerland)*, 12(6). <https://doi.org/10.3390/sports12060151>
4. Currell, K., & Jeukendrup, A. E. (2008). Validity, Reliability and Sensitivity of Measures of Sporting Performance. *Sports Medicine*, 38(4), 297–316. <https://doi.org/10.2165/00007256-200838040-00003>
5. Czyż, S. H. (2021). Variability of Practice, Information Processing, and Decision Making—How Much Do We Know? *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.639131>
6. Del Rossi, G., Malaguti, A., & Del Rossi, S. (2014). Practice Effects Associated With Repeated Assessment of a Clinical Test of Reaction Time. *Journal of Athletic Training*, 49(3), 356–359. <https://doi.org/10.4085/1062-6059-49.2.04>
7. Ferreira, S., Raimundo, A., del Pozo-Cruz, J., Leite, N., Pinto, A., & Marmeleira, J. (2024a). Validity and reliability of a ruler drop test to measure dual-task reaction time, choice reaction time and discrimination reaction time. *Aging Clinical and Experimental*

- Research*, 36(1), 61. <https://doi.org/10.1007/s40520-024-02726-6>
8. Ferreira, S., Raimundo, A., del Pozo-Cruz, J., Leite, N., Pinto, A., & Marmeleira, J. (2024b). Validity and reliability of a ruler drop test to measure dual-task reaction time, choice reaction time and discrimination reaction time. *Aging Clinical and Experimental Research*, 36(1), 61. <https://doi.org/10.1007/s40520-024-02726-6>
 9. Harper, B., Shiraishi, M., & Soangra, R. (2022). Reliability and Validity of Inertial Sensor Assisted Reaction Time Measurement Tools among Healthy Young Adults. *Sensors*, 22(21), 8555. <https://doi.org/10.3390/s22218555>
 10. Jakorinne, P., Haanpää, M., & Arokoski, J. (2018). Reliability of pressure pain, vibration detection, and tactile detection threshold measurements in lower extremities in subjects with knee osteoarthritis and healthy controls. *Scandinavian Journal of Rheumatology*, 47(6), 491–500. <https://doi.org/10.1080/03009742.2018.1433233>
 11. Koo, T. K., & Li, M. Y. (2016). A Guideline of Selecting and Reporting Intraclass Correlation Coefficients for Reliability Research. *Journal of Chiropractic Medicine*, 15(2), 155–163. <https://doi.org/10.1016/j.jcm.2016.02.012>
 12. Lesiakowski, P., Krzepota, J., & Zwierko, T. (2017). The Differentiation of Visual Sensorimotor Processes in the Representatives of Various Sport Disciplines. *Central European Journal of Sport Sciences and Medicine*, 19, 43–53. <https://doi.org/10.18276/cej.2017.3-04>
 13. Luu, A., Winans, A., Suniga, R., & Motz, V. A. (2021). Reaction Times for Esport Competitors and Traditional Physical Athletes are Faster than Noncompetitive Peers. *The Ohio Journal of Science*, 121(2), 15–20. <https://doi.org/10.18061/ojs.v121i2.7677>
 14. Makaracı, Y., Nas, K., Gündüz, K., Uysal, A., Orange, S. T., & Ruiz-Cárdenas, J. D. (2024). Validity and Test–Retest Reliability of a Smartphone App for Measuring Rising Time, Velocity, Power, and Inter-Limb Asymmetry During Single-Leg Sit-to-Stand Test in Female-Trained Athletes. *Measurement in Physical Education and Exercise Science*, 28(4), 391–400. <https://doi.org/10.1080/1091367X.2024.2377096>
 15. Moisello, C., Crupi, D., Tunik, E., Quartarone, A., Bove, M., Tononi, G., & Ghilardi, M. F. (2009). The serial reaction time task revisited: a study on motor sequence learning with an arm-reaching task. *Experimental Brain Research*, 194(1), 143–155. <https://doi.org/10.1007/s00221-008-1681-5>
-

16. Noorani, I., & Carpenter, R. H. S. (2016). The LATER model of reaction time and decision. *Neuroscience & Biobehavioral Reviews*, 64, 229–251. <https://doi.org/10.1016/j.neubiorev.2016.02.018>
17. Pojskic, H., Pagaduan, J., Uzicanin, E., Separovic, V., Spasic, M., Foretic, N., & Sekulic, D. (2019). Reliability, Validity and Usefulness of a New Response Time Test for Agility-Based Sports: A Simple vs. Complex Motor Task. *Journal of Sports Science & Medicine*, 18(4), 623–635.
18. Pugh, A. J., Calhoun, R., Furey, C., Smith, A., Fedewa, T., Schwartz, E., McIndoe, E., Rosenblum, D. J., & Resch, J. E. (2025). A - 29 The Test–Retest Reliability of the Sport Concussion Assessment Tool 6 (SCAT6). *Archives of Clinical Neuropsychology*, 40(Supplement_1), i29–i29. <https://doi.org/10.1093/arclin/afaf058.29>
19. Pumpho, A., Kaewsanmung, S., Keawduangdee, P., Suwannarat, P., & Boonsinsukh, R. (2023). Development of a mobile application for assessing reaction time in walking and TUG duration: Concurrent validity in female older adults. *Frontiers in Medicine*, 10. <https://doi.org/10.3389/fmed.2023.1076963>
20. Qin, S., Nelson, L., McLeod, L., Eremenco, S., & Coons, S. J. (2019). Assessing test-retest reliability of patient-reported outcome measures using intraclass correlation coefficients: recommendations for selecting and documenting the analytical formula. *Quality of Life Research: An International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation*, 28(4), 1029–1033. <https://doi.org/10.1007/s11136-018-2076-0>
21. Sharma, V. K., Subramanian, S. K., & Rajendran, R. (2019). Comparison of cognitive auditory event related potentials and executive functions in adolescent athletes and non-athletes - A cross sectional study. *International Journal of Physiology, Pathophysiology and Pharmacology*, 11(6), 274–282.
22. Wilkerson, G. B., Mether, K. S., Perrin, Z. A., Emberton, S. L., Carlson, L. M., Hogg, J. A., & Acocello, S. N. (2024). Perceptual Response Training for Reduction of Injury Risk Among High School Girls’ Soccer Players. *Brain Sciences*, 14(11), 1091.
23. Woods, D. L., Wyma, J. M., Yund, E. W., Herron, T. J., & Reed, B. (2015). Factors influencing the latency of simple reaction time. *Frontiers in Human Neuroscience*, 9, 131. <https://doi.org/10.3389/fnhum.2015.00131>