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A post-point opponent vocalization shifts intended next-rally tactical orientation toward rally control in competitive squash: A randomized controlled online experiment

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ABSTRACT

The moments between competitive actions constitute a critical decision period in which athletes interpret opponent-generated information and form tactical intentions for what comes next. Yet research on auditory information in sport has focused primarily on sounds occurring during ongoing action, when sound can influence perception of the movement itself. We conducted a randomized two-condition online experiment with 180 adults currently competing in organized squash to test whether an opponent-generated auditory cue encountered between rallies could influence subsequent tactical intention. Participants imagined a standardized match scenario in which an opponent won a long rally at 8–8 in the fifth game, then heard either 5.000 s of squash-court ambience or the identical ambience plus one standardized opponent post-point "Let's go!" vocalization. The primary outcome was a seven-category self-report of intended next-rally tactical orientation; perceived opponent confidence was secondary. Relative to ambience alone, the vocalization condition showed lower tactical-orientation scores (mean 3.31 vs. 4.03; common odds ratio [OR] 0.55, 95% confidence interval [CI] 0.33–0.93; p = 0.024), indicating greater emphasis on rally control and error reduction. Perceived opponent confidence was descriptively higher but not statistically different (OR 1.38, 95% CI 0.83–2.31; p = 0.219). These findings provide controlled proof-of-concept evidence that, in the tested squash scenario, an opponent-generated post-point vocalization can shift immediately reported tactical intention toward greater rally control and error reduction, highlighting the potential relevance of between-point opponent cues to athletes' tactical preparation.

Contribution/Originality: This study is one of the very few studies that have investigated how opponent vocalizations between rallies influence subsequent tactical intentions. Through a randomized experiment involving 180 competitive squash players, it demonstrates that hearing a post-point "Let's go!" shifts intended next-rally tactical orientation toward greater rally control and error reduction.

1. INTRODUCTION

Point-based competition is not psychologically idle between rallies. Once one competitive action has ended, the athlete enters a brief interval in which the outcome of that action is fixed, but the approach to the next remains open. During this period, athletes can update their understanding of the competitive situation, redirect attention, and prepare to approach the next action (Bracco et al., 2025; Vernon, Farrow, & Reid, 2018). Information produced by an opponent at precisely this moment may therefore be consequential: it cannot alter the action that has already occurred, but it may influence the tactical decision that follows. Understanding how athletes respond to opponent-generated

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information between actions is important for explaining how competitive decisions are updated from one exchange to the next.

Squash provides a particularly useful setting in which to examine this process. Singles squash places two opponents within the same confined court and organizes competition into discrete rallies, creating a clearly identifiable interval in which one competitive action has ended, but the next has not yet begun. This structure also keeps the source of opponent-generated information relatively unambiguous while requiring players to repeatedly update tactical choices under direct competitive pressure. Crucially, tactical decision-making in squash is highly sensitive to the immediate competitive situation. Elite players' shot selections vary according to factors including court location and the time available to respond (Vučković et al., 2013), while situation-awareness analyses distinguish responses ranging from defensive shots intended to create time under pressure to attempted winners when attacking conditions permit (Murray, James, Perš, Mandeljc, & Vučković, 2018). Tactical behavior is also inherently interpersonal: analyses of elite players suggest that performance patterns emerge from the coupling of both opponents' behaviors and can vary across different opponents and matches (Murray, James, Perš, Mandeljc, & Vučković, 2019). Consistent with this, players at higher levels of expertise demonstrate better contextual reading and a stronger relationship between appropriate tactical decision-making and execution quality (Catalán-Eslava, González-Víllora, Pastor-Vicedo, & Contreras-Jordán, 2018). Together, these characteristics make squash well suited to testing whether a brief opponent-generated cue encountered between rallies can shift the tactical orientation adopted for the next exchange.

The information used to form those intentions can come from multiple perceptual and contextual sources. Contemporary work on anticipation in racket sports emphasizes that athletes use information about unfolding competitive situations to predict near-future events and prepare appropriate actions (Huesmann & Loffing, 2024). Additionally, athletes can infer movement intentions from action sounds alone (Camponogara, Rodger, Craig, & Cesari, 2017). Experimentally manipulated impact sounds can bias tennis trajectory judgments (Cañal-Bruland, Müller, Lach, & Spence, 2018), and recent evidence indicates that the contribution of auditory information to tennis anticipation depends on temporal and task constraints (Müller, Will, & Cañal-Bruland, 2024). Together, these findings establish audition as a decision-relevant source of competitive information.

Athlete vocalizations constitute a distinct auditory cue because they can be both physically consequential for the vocalizing athlete and perceptually meaningful for an opponent. In collegiate tennis players, grunting has been associated with increased serve and forehand velocity (O'Connell, Hinman, Hearne, Michael, & Nixon, 2014). From the receiver's perspective, a brief extraneous sound concurrent with racket-ball contact can slow and reduce the accuracy of shot-direction judgments (Sinnett & Kingstone, 2010). Vocalizations can also carry interpretable information: acoustic features of professional tennis grunts vary with match context, and listeners can use those features to classify contest outcome above chance (Raine, Pisanski, & Reby, 2017). Manipulating grunt intensity has shifted opponents' predicted ball trajectories (Müller, Jauernig, & Cañal-Bruland, 2019), with later work showing that the contribution of vocal auditory information depends on temporal and task constraints (Müller et al., 2024).

Most of this literature concerns sounds that occur during an ongoing stroke or movement, when auditory information may alter perception of the action itself. A post-point vocalization occupies a different temporal position. It occurs after the previous rally has ended, so it cannot change the trajectory or acoustic perception of the completed shot, but it is encountered before the next rally begins, when a player is forming a new tactical intention. In squash, this interval precedes a concrete tactical decision about how to approach the next exchange, with expert shot selection ranging from defensive responses intended to create time to winner attempts when attacking conditions permit (Murray et al., 2018).

A parallel sport-psychology literature indicates that expressive behavior can shape what opponents infer. Table tennis players form different first impressions and outcome expectations from opponents' nonverbal behavior (Greenlees, Bradley, Holder, & Thelwell, 2005), and score-related nonverbal changes have altered observers'

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confidence about winning a basketball game (Furley & Schweizer, 2014). In laboratory soccer penalty scenarios, post-performance pride and shame expressions changed opponents' anticipated emotions, cognitions, and performance expectations (Furley, Moll, & Memmert, 2015). Observational work in table tennis has also documented outward emotional reactions after points, including verbalizations, although positive and negative reactions did not predict the outcome of the immediately following point (Fritsch et al., 2020). Together, these findings suggest that opponent-generated post-performance cues may have consequences at two related levels: how athletes perceive their opponents and how they intend to respond tactically. They therefore provide a basis for examining intended tactical orientation as the primary response to the cue and perceived opponent confidence as a complementary secondary response.

The present study tested whether opponent-generated auditory information encountered between actions can influence subsequent tactical intention. The present study tested whether a standardized opponent post-point "Let's go!" vocalization, presented after the same competitive squash scenario, influenced intended next-rally tactical orientation relative to court ambience alone. The primary hypothesis was that exposure to the vocalization would shift intended next-rally tactical orientation toward greater rally control and error reduction relative to ambience alone. Because opponent expressive behavior can also shape interpersonal judgments, the secondary hypothesis was that the same vocalization would increase perceived opponent confidence. Perceived confidence was treated as a complementary secondary outcome rather than as a mediator of the primary effect.

2. MATERIALS AND METHODS

2.1. Participants

Ethics approval for the study protocol was granted by the Advarra Institutional Review Board (protocol Pro00095679; approved 6 July 2026). Advarra approved a waiver of documentation of informed consent. Active electronic informed consent was required before eligibility screening and study participation.

Participants were adults, currently competing in organized squash at the club/local level or above. Eligibility required participants to be at or above the age of majority in the jurisdiction in which they lived, to be currently competing in organized squash, to be comfortable reading and responding to the study in English, and not to have previously completed the study. "Club/local level" referred to players who regularly participated in organized squash play or competition through their club or local competitive setting, rather than beginners or individuals who played only casually. Individuals who reported deafness or hearing difficulty that would prevent them from reliably perceiving the auditory stimulus were not eligible to participate.

Participation was voluntary and uncompensated. Participants were recruited through squash clubs, competitive-player networks, direct electronic communication, and relevant online or social-media channels. Recruitment materials described the project neutrally as research on decision-making in competitive squash and did not disclose the experimental hypothesis, the existence of the vocalization manipulation, the expected direction of any effect, or the participants' eventual condition assignments.

Participant characteristics collected for descriptive reporting included age, gender, current competitive level, years of organized competitive squash, weekly training or play hours, number of competitive matches in the previous 12 months, frequency of encountering opponent post-point vocalizations, and reported country of competition. For descriptive presentation in Table 1, reported countries were grouped into broader geographic regions.

2.2. Study Design

The study was a two-condition, between-participants randomized controlled online experiment. The independent variable was experimental audio condition, with participants randomly assigned to either an ambience-only control condition or a vocalization condition containing the identical ambience plus one standardized opponent post-point "Let's go!" vocalization. The primary dependent variable (DV) was self-reported intended next-rally tactical orientation, and the secondary DV was perceived opponent confidence. These DVs captured complementary

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responses to the same randomized opponent-generated cue: the primary DV assessed the participant's own intended tactical response, whereas the secondary DV assessed the participant's perception of the opponent.

The experiment was administered through a single anonymous Qualtrics survey. After providing electronic consent, respondents completed the eligibility screening and confirmed their use of headphones or earbuds. Participants were instructed to complete the experiment in a reasonably quiet environment and to use headphones or earbuds rather than built-in device speakers or external speakers.

Eligible participants were assigned automatically in an approximately 1:1 ratio using the Qualtrics Survey Flow Randomizer with evenly presented elements enabled. Randomization occurred immediately before stimulus exposure and required no investigator intervention. Participants and recruitment personnel could not select a condition. Randomizer counts were reset after pre-study testing and were not manually altered during recruitment. The survey Back Button was disabled.

After randomization, participants read the standardized match scenario and were then presented with the audio stimulus corresponding to their assigned condition. Immediately after stimulus exposure, participants completed the primary tactical-orientation outcome followed by the secondary perceived-confidence outcome. Manipulation, scenario, and technical checks were administered only after both outcomes, followed by the participant-characteristic items.

Participants were not informed before stimulus exposure of the specific experimental hypothesis, the existence of the vocalization manipulation, or its expected direction of effect.

2.3. Sample Size Planning

An a priori power analysis for the primary seven-category outcome assumed a two-group proportional-odds model, equal allocation, two-sided alpha = 0.05, and a target common OR of 0.46. Because no directly comparable prior experiment provided a reliable effect estimate for this outcome, the planning effect was defined according to its substantive implication for the response scale. Under the centered hypothetical distribution, an OR of 0.46 corresponded to a shift in the expected response from 4.00 to approximately 3.28, which was treated as a substantively meaningful change following a single brief between-rally exposure.

Using Whitehead (1993) sample-size method for ordered categorical data, the total sample required for 80% power ranged from 160.0 to 170.3 across six hypothetical baseline response distributions. Recruitment therefore aimed to obtain approximately 200 initiated survey responses to allow for respondents who might decline consent, fail the eligibility criteria, or discontinue before randomization. The planning distributions were hypothetical rather than derived from pilot or study outcome data.

2.4. Experimental Scenario and Audio Stimuli

Both conditions received the same standardized written scenario.

"Please imagine the following situation as realistically as possible. You are playing a best-of-five competitive squash match against an opponent of similar playing ability. The match is tied at two games each, and the score in the fifth game is 8-8. During the next rally, both players exchange several difficult shots in a long, evenly contested rally. Your opponent eventually wins the rally. The score is now 9-8 to your opponent. Your opponent will serve the next point."

The vignette intentionally avoided condition-specific descriptions of dominance, momentum, or tactical pressure.

The phrase "Let's go!" was selected to provide a brief, ecologically plausible competitive vocalization without explicitly prescribing a tactical response. Sport-psychology research identifies "Let's go!" as a prototypical form of motivational self-talk (Van Raalte, Vincent, & Brewer, 2016), and the expression has been documented in natural competitive racket-sport settings. Among professional tennis players, "Vamos" ("Let's go") was the most frequently reported self-talk expression in one study (Cordellat Marzal & Valenciano Martínez, 2022), while research with

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competitive junior tennis players has likewise documented motivational verbalizations including "Let's go!" during match contexts (Boudreault, Trottier, & Provencher, 2018; Boudreault, Trottier, & Provencher, 2019; Thibodeaux & Winsler, 2020). The phrase was particularly suitable for the present experiment because it is brief and motivational but does not itself specify whether the listener should attack or defend, nor does it explicitly assert confidence, dominance, intimidation, or another psychological state.

Candidate vocalizations were recorded in the same empty squash court during a quiet period with an OSA Lavalier Wireless Mini Microphone using Apple Voice Memos. The microphone was positioned approximately 15-20 cm from the speaker's mouth at approximately a 30-45-degree off-axis angle. Four competitive squash players each produced three takes after receiving the same instruction.

"Imagine you have just won a long, difficult rally at 8-8 in the fifth game of a close, competitive squash match, with the match tied at two games each, against an opponent of similar ability. Immediately after the rally, say 'Let's go!' once in the way you would naturally celebrate that point during a real competitive match. Do not deliberately exaggerate or suppress your normal delivery."

One recording from each speaker was retained solely based on technical-quality criteria: complete production of the utterance, absence of obvious distortion, and absence of unintended background noise. Recordings were not selected for perceived confidence, emotional intensity, intimidation, or expected experimental effect. Before participant recruitment, one of the four technically acceptable recordings was selected using a computer-generated random number from 1 to 4. The selected vocalization was not altered by pitch modification, equalization, dynamic-range compression, noise reduction, artificial reverberation, or other voice-altering processing.

Both final experimental files were 5.000 s long and used the same squash-court ambience. The ambience-only file served as the control stimulus; the vocalization file contained the identical ambience with the selected "Let's go!" utterance added at a fixed point. The files were matched in duration and audio format, frozen before recruitment, and presented through the same survey interface and playback procedure. Because participants listened remotely using their own devices and headphones or earbuds, the stimuli are described as standardized digital audio files rather than identical sound-pressure exposures at the ear.

The audio appeared on a dedicated Qualtrics page and was intended to play once. Custom JavaScript recorded playback initiation, successful completion, and playback errors as embedded fields, and progression to the outcome page was enabled only after the audio-ended event was registered. A hidden timing item recorded time spent on the stimulus page. The anonymous survey disabled identifying response metadata and used Qualtrics multiple-submission protection as an additional browser-level deterrent.

2.5. Outcome Measures and Manipulation Checks

The primary outcome was self-reported intended next-rally tactical orientation, measured immediately after the audio using one ordered seven-category item: "Thinking only about the next rally, how would you intend to play?" The scale ranged from 1 ("Prioritize keeping the rally under control and reducing the chance of making an error, even if this means passing up some attacking opportunities") through 4 ("Balance these priorities equally") to 7 ("Prioritize taking attacking opportunities to gain an advantage quickly, even if this increases the chance of making an error"). Higher values therefore represented a more attack-oriented intention with greater willingness to accept execution-error risk; lower values represented greater emphasis on rally control and error reduction. The seven-category format was used to represent this tactical orientation as a graded bipolar continuum while retaining a substantively meaningful midpoint. The central category represented equal priority between the two tactical orientations, with three ordered degrees of departure toward greater rally control on one side and greater attacking emphasis on the other. This structure avoided forcing participants with genuinely balanced intentions toward either tactical direction while providing sufficient response differentiation. Similar seven-category formats with an explicit midpoint have been used in sport-specific scenario research to capture graded judgments about risk and safety (Keller,

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Bieleke, & Wolff, 2023), and methodological evidence indicates that the reliability, validity, and discriminating power of rating scales generally improve as response categories increase up to approximately seven (Preston & Colman, 2000). The endpoint reflects intended tactical orientation rather than observed risk-taking, shot selection, match behavior, or a validated psychometric risk scale.

The secondary outcome was perceived opponent confidence, assessed immediately after the primary item: "How confident does your opponent appear going into the next point?" Responses ranged from 1 (not confident at all) to 7 (extremely confident). This item assessed the participant's perception of the opponent, not the opponent's actual confidence, and it was not treated as a mediator of the primary outcome.

Manipulation, technical, and scenario checks were administered only after both outcomes had occurred. These included voice detection, phrase recognition, source attribution, playback completion, obvious technical problems, listening equipment, scenario realism, scenario immersion, treatment-condition vocalization naturalness and interpretation, rally-outcome, and score comprehension.

2.6. Statistical Analysis

Statistical analyses were performed using Python 3.13.5 and statsmodels 0.14.6.

The primary randomized analysis included all randomized participants with an observed primary outcome. Post-treatment manipulation-check responses, including failure to identify the phrase or attribute the voice to the opponent, were not used as exclusion criteria. All initiated and incomplete responses were retained in the raw export, and eligibility, completion, and analysis-set decisions were implemented through scripted rules rather than manual deletion. Technical protocol deviations occurring after randomization were likewise not used to remove participants from the primary randomized comparison.

The primary outcome was treated as an ordered seven-category response. The inferential model was a proportional-odds (ordinal logistic) regression with experimental condition as the sole predictor (McCullagh, 1980), coded as 0 for ambience and 1 for vocalization. Under this coding, a common OR below 1 indicates a shift toward the lower, rally-control/error-reduction end of the scale in the vocalization condition, whereas an OR above 1 indicates a shift toward the higher, attack-oriented end. The same model form was applied to the secondary confidence item. Effect estimates are reported as common ORs with 95% Wald CIs and two-sided p-values. Full response distributions and descriptive means and standard deviations are provided for interpretability but do not replace the ordinal analysis.

Baseline characteristics were summarized descriptively by randomized condition without significance tests for baseline balance. Manipulation and technical checks were also descriptive and were not converted into additional hypothesis tests. No mediation analysis was conducted. The proportional-odds structure was examined with threshold-specific cumulative-logit diagnostic fits. Condition ORs for the primary outcome remained below 1 across all thresholds; estimates for the secondary outcome were at or above 1 but varied more across thresholds.

3. RESULTS

3.1. Participant Characteristics

A total of 215 survey responses were initiated. Three respondents declined consent, 17 failed to meet the eligibility criteria, and 15 discontinued or remained incomplete before randomization, leaving 180 eligible participants who were randomized 1:1 to the ambience-only condition (n = 90) or vocalization condition (n = 90). All 180 randomized participants provided complete data for both the primary and secondary outcomes and were included in the corresponding analyses.

The overall mean age was 26.05 years (SD = 6.14), and the mean organized competitive squash experience was 7.85 years (SD = 4.04). Participants represented club/local through international competitive levels and competed across multiple continents. Descriptive participant characteristics by randomized condition and for the overall sample are reported in Table 1.

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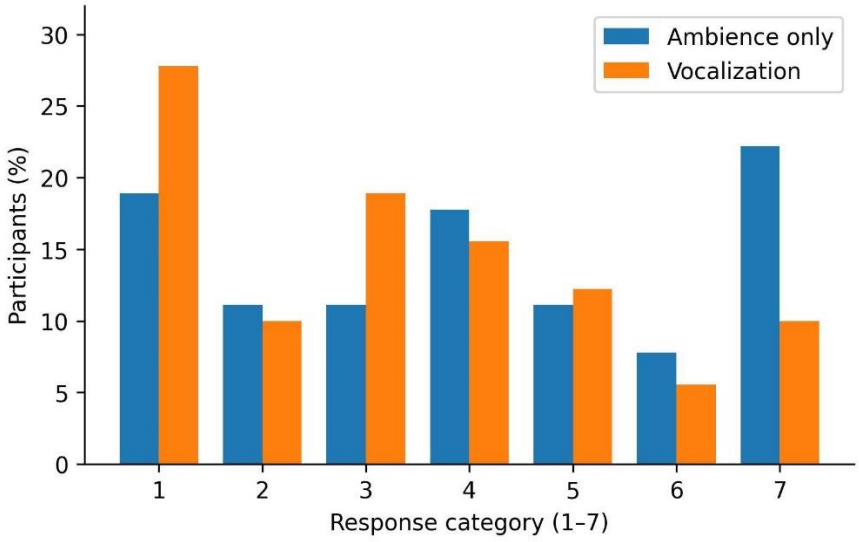
Table 1. Participant characteristics.

Characteristic	Ambience only (n = 90)	Vocalization (n = 90)	Total (N = 180)
Age, years, mean (SD)	26.3 (6.35)	25.8 (5.94)	26.05 (6.14)
Gender, n (%)			
Man	54 (60.0)	55 (61.1)	109 (60.6)
Woman	26 (28.9)	32 (35.6)	58 (32.2)
Non-binary	3 (3.3)	1 (1.1)	4 (2.2)
Another identity	4 (4.4)	0 (0.0)	4 (2.2)
Prefer not to say	3 (3.3)	2 (2.2)	5 (2.8)
Competitive level, n (%)			
Club/Local	26 (28.9)	29 (32.2)	55 (30.6)
Regional	28 (31.1)	27 (30.0)	55 (30.6)
Provincial/State	29 (32.2)	23 (25.6)	52 (28.9)
National	7 (7.8)	9 (10.0)	16 (8.9)
International	0 (0.0)	2 (2.2)	2 (1.1)
Competitive squash experience, years, mean (SD)	8.5 (3.96)	7.2 (4.03)	7.85 (4.04)
Training/Play, h/Week, mean (SD)	6.27 (2.29)	6.14 (2.57)	6.21 (2.43)
Competitive matches in previous 12 months, mean (SD)	20.96 (10.22)	21.74 (13.07)	21.35 (11.71)
Prior opponent vocalization frequency (1-7), mean (SD)	4.41 (1.48)	4.74 (1.65)	4.58 (1.57)
Geographic region of competition, n (%)			
North America	40 (44.4)	41 (45.6)	81 (45.0)
Asia	21 (23.3)	25 (27.8)	46 (25.6)
Europe	17 (18.9)	13 (14.4)	30 (16.7)
Oceania	7 (7.8)	7 (7.8)	14 (7.8)
Other / Unspecified	5 (5.6)	4 (4.4)	9 (5.0)

Note: SD = standard deviation. Values presented as mean (SD) represent the mean followed by the standard deviation in parentheses. Percentages may not total 100% because of rounding. No inferential tests of baseline balance were performed.

3.2. Intended Next-Rally Tactical Orientation

The response distribution was shifted toward lower categories in the vocalization condition (Figure 1). The ambience-only mean was 4.03 (SD 2.17; median 4, IQR 2-6), compared with 3.31 (SD 1.98; median 3, IQR 1-5) in the vocalization condition.



Note: Higher scores indicate a more attack-oriented intended next-rally tactical orientation with greater willingness to accept execution-error risk.

Figure 1. Distribution of intended next-rally tactical orientation by experimental condition.

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In the proportional-odds model, exposure to the vocalization was associated with lower odds of occupying a higher tactical-orientation category (common OR 0.550, 95% CI 0.328-0.925; p = 0.024). Thus, the randomized contrast corresponded to greater reported emphasis on rally control and error reduction rather than on earlier attacking opportunities.

3.3. Perceived Opponent Confidence

Perceived opponent confidence was descriptively higher following the vocalization (mean 4.58, SD 1.93; median 4, IQR 3-6.75) than following ambience alone (mean 4.19, SD 2.14; median 4, IQR 2-6). The common OR was 1.381 (95% CI 0.825-2.312; p = 0.2189). The CI included the null value, and the secondary test did not meet the conventional two-sided 0.05 significance threshold. The secondary result therefore does not establish that the vocalization altered perceived confidence and provides no basis for treating confidence as the mechanism of the primary effect. Table 2 summarizes the descriptive and proportional-odds results for the primary and secondary outcomes.

Table 2. Ordinal outcomes.

Outcome	Ambience mean (SD)	Vocalization mean (SD)	Common OR (95% CI)	p-value
Intended next-rally tactical orientation (Primary DV)	4.03 (2.17)	3.31 (1.98)	0.550 (0.328-0.925)	0.0242
Perceived opponent confidence (Secondary DV)	4.19 (2.14)	4.58 (1.93)	1.381 (0.825-2.312)	0.2189

Note: SD = standard deviation, OR = odds ratio from proportional-odds logistic regression, coded 0 = ambience only and 1 = vocalization. For the primary outcome, OR < 1 denotes a shift toward lower, rally-control/error-reduction categories. For the secondary outcome, OR > 1 denotes higher perceived-confidence categories.

3.4. Manipulation, Scenario and Technical Checks

Manipulation checks indicated clear, although imperfect, separation of the two audio conditions (Table 3). In the vocalization condition, 86 of 90 cases (95.6%) reported hearing a voice, 82 of 90 (91.1%) selected "Let's go!" as the phrase heard, and 72 of 90 (80.0%) attributed the voice to the opponent. In the ambience condition, 79 of 90 (87.8%) reported no voice. Treatment-condition naturalness averaged 5.43 of 7 (SD 0.84). Forty-six of 90 vocalization-condition cases (51.1%) characterized the utterance primarily as a celebration after winning the rally, 23 (25.6%) as self-encouragement or motivation, 10 (11.1%) as an expression of emotion, and 5 (5.6%) as communication directed toward the opponent; the remaining 6 (6.7%) selected an uncertain or other interpretation. The remaining 10 participants (11.1%) in the ambience-only condition and 2 participants (2.2%) in the vocalization condition selected 'Not sure' in response to the voice-detection question.

Scenario comprehension was high across conditions: 173 of 180 cases (96.1%) correctly identified that the opponent had won the preceding rally and 168 of 180 (93.3%) correctly identified the score as 9-8 to the opponent. The audio was reported to have played to completion in 175 cases (97.2%); 174 (96.7%) reported no obvious technical problem. Nine cases reported using built-in device speakers despite the headphone/earbud instruction. Scenario realism averaged 4.92 (SD 0.86) in the ambience condition and 5.04 (SD 0.96) in the vocalization condition; immersion averaged 4.86 (SD 1.02) and 4.73 (SD 1.20), respectively. These post-treatment checks were not used to remove cases from the primary randomized analysis.

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Table 3. Manipulation, comprehension and technical checks.

Check	Ambience only	Vocalization	Overall / treatment-specific
Voice detected	1/90 (1.1%)	86/90 (95.6%)	N/A
Correctly recognized "Let's go!"	N/A	82/90 (91.1%)	Treatment manipulation check
Attributed voice to opponent	N/A	72/90 (80.0%)	Treatment manipulation check
No voice reported	79/90 (87.8%)	2/90 (2.2%)	Control separation
Voice detection — Not sure	10/90 (11.1%)	2/90 (2.2%)	Uncertain voice detection
Vocalization naturalness, mean (SD)	N/A	5.43 (0.84)	1-7 scale
Correct rally outcome	84/90 (93.3%)	89/90 (98.9%)	173/180 (96.1%)
Correct score	83/90 (92.2%)	85/90 (94.4%)	168/180 (93.3%)
Playback complete	87/90 (96.7%)	88/90 (97.8%)	175/180 (97.2%)
No obvious technical problem	86/90 (95.6%)	88/90 (97.8%)	174/180 (96.7%)

Note: SD = standard deviation. All checks were measured after the primary and secondary outcomes and were descriptive rather than additional inferential endpoints.

4. DISCUSSION

This randomized controlled online experiment tested whether an opponent-generated auditory event encountered between competitive actions could alter the tactical intention formed for the subsequent action. The primary hypothesis was that exposure to the standardized post-point "Let's go!" vocalization would shift intended next-rally tactical orientation toward greater rally control and error reduction relative to ambience alone. The results supported this hypothesis: participants exposed to the vocalization had lower odds of occupying a higher, more attack-oriented tactical-orientation category. The secondary hypothesis was that the vocalization would increase perceived opponent confidence. Although confidence was descriptively higher in the vocalization condition, this hypothesis was not supported statistically. Together, the results indicate that exposure to this specific post-point vocalization altered intended tactical orientation without establishing a corresponding change in perceived opponent confidence.

The timing of the manipulation is central to the interpretation of the primary result. Prior auditory-sport research has largely examined information available during an unfolding action, including impact sounds, action sounds, and grunts that can affect anticipation or trajectory judgments (Camponogara et al., 2017; Cañal-Bruland et al., 2018; Müller et al., 2019; Müller et al., 2024; Sinnett & Kingstone, 2010; Sors et al., 2018; Takeuchi, 1993). In the present experiment, however, the vocalization occurred only after the preceding rally had ended. The subsequent difference in tactical intention therefore cannot be attributed to acoustic masking of the preceding racket-ball impact or direct auditory distortion of the completed ball trajectory. Instead, the vocalization was encountered during the interval in which participants were preparing to form an intention for the next rally. The finding therefore extends auditory-sport research from sounds that influence perception of an ongoing action to opponent-generated auditory information encountered between completed and forthcoming actions.

One plausible explanation is that the vocalization functioned as interpersonal competitive information that participants incorporated when deciding how to approach the next rally. Competitive expressions can provide information about an opponent even when they do not directly alter perception of the sporting action itself. Greenlees et al. (2005), for example, found that table-tennis players formed different impressions and outcome expectations from opponents' nonverbal behavior, while Furley et al. (2015) showed that post-performance pride expressions altered opponents' anticipated emotions, cognitions, and performance expectations in soccer penalty scenarios. Tennis vocalizations can likewise carry information about competitive context: listeners have been shown to use acoustic properties of grunts to make above-chance judgments about contest outcome (Raine et al., 2017). These findings are consistent with the broader possibility that athletes treat opponent-generated expressive cues as socially informative signals when evaluating an upcoming competitive interaction. Furley et al. (2015) specifically interpreted such interpersonal effects through the emotions-as-social-information framework, in which observers use expressive behavior to infer information relevant to their own response (Van Kleef, 2009).

In the present scenario, the opponent had just won a long rally to move ahead 9–8 in the fifth game. Hearing an additional celebratory vocalization may therefore have changed how participants appraised the immediate competitive

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situation and, in turn, how much tactical risk they were willing to accept on the next rally. A shift toward rally control is compatible with participants responding to the cue by placing greater value on avoiding an immediate error while trailing late in the match. However, the experiment did not measure the intervening appraisal responsible for this adjustment, and several alternatives remain possible. Related work on verbal behavior in sport demonstrates that opponent-generated speech can alter psychological processes other than confidence. In a competitive basketball free-throw experiment, Ring, Kavussanu, Al-Yaaribi, Tenenbaum, and Stanger (2019) found that verbal insults increased anger, while both insulting and distracting verbal behavior increased attentional distraction; importantly, there was no simple overall direct effect on performance. Although a post-point "Let's go!" is qualitatively different from sledging or an insult, these findings illustrate that verbal competitive cues can influence attention and affect through multiple psychological pathways, rather than necessarily operating through perceived opponent confidence.

The secondary hypothesis concerning perceived opponent confidence was not supported. This differs from research showing that expressive behavior can alter confidence-related judgments. Furley and Schweizer (2014) found that experienced basketball players' confidence in beating an opponent changed after viewing naturally occurring score-related nonverbal behavior, and Furley et al. (2015) found that observing an opponent display pride was associated with less favorable anticipated cognitions, including lower confidence, among opposing players. Other work has similarly shown that dominant and submissive nonverbal behavior can influence outcome confidence even when additional performance information is available (Seiler, Schweizer, & Seiler, 2018). The difference from the present result may reflect the nature of the cue. Those studies presented comparatively rich and interpretable visual expressions of dominance, pride, or score-related body language, whereas the present manipulation consisted of a single brief auditory utterance. "Let's go!" can plausibly be interpreted as celebration, self-encouragement, emotional release, increased activation, or communication toward an opponent rather than specifically as a display of confidence. The match context itself also already informed participants that the opponent had just won a long rally and taken a 9–8 lead, potentially limiting the additional confidence information supplied by the vocalization. The observed OR of 1.38 was in the hypothesized direction, but its confidence interval included both the null and potentially positive effects; the appropriate conclusion is therefore insufficient evidence for a confidence effect, rather than evidence that confidence was unaffected.

The post-outcome checks support the basic interpretability of the experimental contrast. Most participants in the vocalization condition detected a voice and recognized the phrase, although attribution to the opponent was less complete (72 of 90, 80.0%), and the vocalization was rated above the midpoint for naturalness. These results make failure to perceive the manipulation an unlikely explanation for the primary finding or the nonsignificant secondary result, although imperfect source attribution may have weakened appraisals specifically concerning the opponent. Manipulation-check responses were not used to exclude participants because they were measured after randomization; conditioning the primary analysis on successful recognition would have selected participants according to a post-treatment variable and compromised the randomized comparison (Montgomery, Nyhan, & Torres, 2018).

The findings may also have practical implications for psychological and tactical preparation in point-based sports. If opponent-generated cues encountered between rallies can influence subsequent tactical intention, athletes may benefit from training that helps them recognize such information while preserving deliberate, context-appropriate decision-making. Rather than attempting to ignore opponent behavior, between-point routines could be used to redirect attention toward task-relevant cues and the intended tactical plan before the next rally. This possibility is consistent with evidence that structured pre- and post-point routines can support attentional refocusing and performance under competitive pressure (Bracco et al., 2025; Rupprecht, Tran, & Gröpel, 2024). Whether such training can reduce or strategically regulate responses to opponent vocalizations should be tested directly in future intervention studies.

Limitations should be considered when interpreting these findings. First, the manipulation was both stimulus-specific and compound: the experiment used one vocalization token from one randomly selected speaker, and adding

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"Let's go!" simultaneously introduced vocal presence, lexical and semantic content, acoustic salience, and opportunities to infer emotion or intent. Although tennis research shows that vocal acoustics can carry competitive information (Raine et al., 2017), the present experiment neither quantified nor independently manipulated prosody, pitch, loudness, semantic content, emotional intensity, or perceived intimidation. The randomized contrast therefore estimates the effect of this complete vocalization in this scenario and cannot identify which component produced the observed shift or establish a population-level effect across speakers, phrases, or vocalization styles. Second, the primary outcome measured intended next-rally tactical orientation in a hypothetical scenario rather than actual on-court behavior, and both outcomes were measured using purpose-built single items rather than validated multi-item scales; accordingly, the findings should not be generalized to observed shot selection, stable risk preference, aggression, momentum, or global confidence. Third, remote participation introduced heterogeneity in listening devices, environments, and physical sound level, with nine participants reporting use of built-in speakers despite the headphone/earbud instruction; the experiment therefore standardized the digital audio files rather than sound-pressure exposure at the ear. Finally, the sample was restricted to currently competing adult squash players, limiting generalization to junior athletes, former players, other racket sports, team sports, or non-athletes.

Future work should use multiple speakers and vocalization tokens, manipulate candidate acoustic and semantic features independently, test whether comparable effects emerge in controlled or instrumented match-play settings, and examine whether between-point psychological routines can help athletes regulate their responses to opponent-generated cues.

5. CONCLUSION

In adult competitive squash players, this study tested whether an opponent-generated post-point vocalization encountered between rallies could influence the tactical intention formed for the next rally. Exposure to one standardized "Let's go!" vocalization shifted self-reported intended next-rally tactical orientation toward greater rally control and error reduction relative to matched ambience, while the secondary difference in perceived opponent confidence was not statistically significant. These findings provide controlled proof-of-concept evidence that interpersonal auditory information encountered between competitive actions can influence subsequent tactical intention.

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Institutional Review Board Statement: The Advarra Institutional Review Board granted ethical approval for this study on 6 July 2026 (Ref. No. Pro00095679), with approval valid through 6 July 2027. The study was conducted in accordance with applicable local legislation and institutional requirements.
Informed Consent Statement: Electronic informed consent was obtained from all participants before study procedures and all data were anonymized to protect participant confidentiality. Advarra approved a waiver of documentation of informed consent.
Transparency: The author states that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The author declares that there are no conflicts of interest regarding the publication of this paper.

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