ORIGINAL ARTICLE

Offering to receive, movement to receive and defensive line breaks at the 2026 Men's World Cup

Xin Yang . *School of Physical Education. Guangdong University of Education. Guangzhou, Guangdong, China.*
Jitong Chen. *School of Physical Education. Guangdong University of Education. Guangzhou, Guangdong, China.*

ABSTRACT

FIFA-defined off-ball receiving measures describe related but distinct aspects of attacking play. We examined adjusted team-match associations of Offers Made, the proportion recorded as Offers Received, and five Movement to Receive categories with Defensive Line Breaks. Official reports from all 104 matches of the 2026 Men's World Cup yielded 208 team-match observations. Prespecified negative binomial (NB2) models adjusted for attacking activity and match context, with two-way team/match clustered covariance, approximate *t*/*F* inference and Holm correction. Per standard deviation, Offers Made was positively associated with Defensive Line Breaks (incidence rate ratio [IRR] = 1.172, 95% CI [1.031, 1.332]), whereas the receipt-proportion estimate was near unity (IRR = 0.984, 95% CI [0.900, 1.076]). The movement block showed an overall association (Holm-adjusted $p < .001$), and a separate equal-coefficient comparison indicated a non-uniform standardised profile. In Behind showed a positive category-specific estimate (IRR = 1.273, 95% CI [1.169, 1.387]); the other four intervals included unity. However, In Behind and Defensive Line Breaks share a final-defensive-unit spatial reference, and aggregated data cannot establish event-level overlap or temporal ordering. These findings support separate reporting of option volume, recorded receipt proportion and movement categories, without establishing independent tactical effects or causal mechanisms.

Keywords: performance analysis, soccer, athletic performance, spatial behaviour, regression analysis.

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Corresponding author. *School of Physical Education, Guangdong University of Education, 30 Yingbin Avenue West, Huadu District, Guangzhou, Guangdong 510800, China.*
E-mail: yangxin3171@gmail.com
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INTRODUCTION

A pass records one selected action, but not necessarily the receiving options available before it. Footballers may present an option without subsequently receiving the ball, and off-ball movement may occur without a completed penetrative action. Tracking studies have examined the availability of passing opportunities and defensive pressure around potential receivers (Gómez-Jordana et al., 2021; Herold et al., 2022), while spatial constraints also shape penetrative passing (Travassos et al., 2023). At team-match level, the measurement challenge is to distinguish the volume of options created, the proportion recorded as received and the types of receiving movement when examining their associations with a defined penetration outcome. These measures should not be treated as interchangeable descriptions of a single form of off-ball effectiveness.

FIFA records these aspects of play using related but distinct measures. Offering to Receive denotes a deliberate action presenting a potential receiving option, regardless of whether a reception occurs (FIFA, 2021a). Movement to Receive describes five categories relative to the opposition's defensive structure: In Front, In Between, In Behind, In to Out and Out to In (FIFA, 2021b). The Defensive Line Breaks outcome used here reflects completed penetration beyond the opposition's final defensive unit (FIFA, 2021c, 2023, 2026b). A central interpretive issue is that In Behind and Defensive Line Breaks share a reference to that final defensive unit. Such behaviours may occur within the same attacking sequence, but the available whole-match aggregates cannot establish whether their recorded source events overlap. An association between them therefore cannot establish that running in behind independently produces line breaks.

Prior studies have examined deep runs, receiving options, spatial availability, penetrative actions and FIFA attacking measures using different outcomes and analytical scales (de França et al., 2024; Gómez-Jordana et al., 2021; Herold et al., 2022; Kang & Che Him, 2024; Thönnessen et al., 2026; Wei et al., 2024). Recent work, including a structured taxonomy and a scoping review, also documents heterogeneity in definitions and analytical approaches to off-ball behaviour (Esposito et al., 2026a, 2026b). The contribution of the present study is not to discover a new causal determinant of penetration. Instead, it compares FIFA-defined receiving measures within a common adjusted team-match framework, assessing whether absolute option-creation volume, relative recorded receipt and five movement counts provide uniform or distinguishable association profiles for Defensive Line Breaks.

Using official reports from all 104 matches of the 2026 FIFA Men's World Cup, we examined three hypotheses prespecified before formal effect analysis: H1 concerned Offers Made, H2 the proportion of Offers Made recorded as Offers Received, and H3 the five Movement to Receive categories entered jointly. Defensive Line Breaks was the sole primary outcome. The estimates are conditional team-match associations, not event-level effects or estimates of tactical superiority.

MATERIAL AND METHODS

Participants

This observational study used the official FIFA post-match summary reports (PMSRs) for all 104 matches of the 2026 FIFA Men's World Cup (FIFA, 2026b). Each record represented one team in one match, yielding 208 observations from 48 teams. The sample comprised 72 group-stage and 32 knockout matches; nine included extra time. Team and match identifiers retained the paired observations.

Measures

FIFA source labels and definitions were retained. Offering to Receive is a deliberate action that presents a potential receiving option; actual receipt is not required. Offers Made and Offers Received are the recorded

counts from the same reporting framework (FIFA, 2021a, 2026b). Their ratio is the proportion of Offers Made recorded as Offers Received. All 208 records satisfied Offers Made > 0 and Offers Received ≤ Offers Made; team totals agreed with aggregated player rows and printed percentages after rounding (Supplementary Material 1, Section S1). The team-match receipt proportion was entered as an explanatory variable for Defensive Line Breaks, not modelled as the probability of an offer being received. Since Offers Made denominators vary across observations, the proportions may contain unequal amounts of underlying count information; the fitted H2 model did not explicitly account for denominator-dependent precision.

Movement to Receive describes movement relative to opposition organisation. In Front refers to movement in front of the first opposition unit; In Between, within or between units inside the team shape; In Behind, beyond the final unit; and In to Out and Out to In, movement across the boundary of that shape (FIFA, 2021b). Full descriptions and starting-position qualifications are in Supplementary Material 1, Section S1. Defensive Line Breaks was the PMSR Match Summary count, checked against completed defensive-unit counts in the Line Breaks panels (FIFA, 2021c, 2023, 2026b). Supplementary Material 1, Supplementary Figure 1 maps these constructs and their shared spatial references.

H1 and H2 were assessed in separate models; H3 entered all five raw movement counts together. The five counts reconstructed All Movement Types, which, with No Movement, reconstructed Offers Made. These deterministic totals were therefore excluded from H3; the counts were not treated as shares of a fixed composition. A prespecified joint model included Offers Made and the proportion together, subject to predictor-only collinearity checks (Supplementary Material 1, Section S3).

Exposure and context adjustment

All primary models adjusted for Passes Attempted, pre-match Elo difference (team minus opponent), time leading, time trailing, group versus knockout stage, and actual match duration. Passes Attempted was retained as a prespecified covariate to account, in part, for differences in overall attacking activity between team-match observations; it was neither an offset nor a validated denominator of line-breaking opportunities. Territorial dominance and tactical style may affect receiving measures, attempted passes and line breaks simultaneously. Receiving activity may also precede some passing actions, so conditioning on Passes Attempted could remove part of an underlying association or introduce collider-related distortion under certain causal structures. These temporal and causal pathways cannot be resolved from contemporaneous whole-match summaries. Accordingly, the reported IRRs describe conditional associations with expected whole-match line-break counts at given values of attempted passes and other measured covariates, rather than per-pass rates, total behavioural effects or causally identified relationships. Elo used the latest published rating before each match, starting from the pretournament table (World Football Elo Ratings, 2026). Score-state durations used approximate FIFA timeline timing (FIFA, 2026a); time level was omitted because the three states sum to duration. Duration included stoppage time and extra time but excluded intervals and penalty shootouts. These variables describe whole-match context rather than exact in-possession time. Supplementary Material 1, Section S13 provides source locators.

Procedures

Values were checked through source-panel comparisons, player-to-team aggregation and deterministic field identities. All required primary fields were complete, and no match was excluded. The statistical analysis plan (SAP) was internally frozen on 10 September 2026 before formal effect analysis (Supplementary Material 1, Section S13). This internal freeze occurred after the tournament and was neither pretournament planning nor prospective public preregistration.

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This study used only publicly available FIFA match reports and derived team-match data. It involved no participant recruitment, intervention or personally identifiable information; therefore, ethics approval was not required.

Statistical analysis

The primary models were negative binomial generalised linear models with quadratic variance (NB2) and a log link. This prespecified fallback was applied uniformly to H1, H2, H3 and the joint model after the planned crossed team/match random-intercept models reached the prespecified boundary and the retry did not resolve the numerical criteria (Brooks et al., 2017). Two-way team/match clustered covariance addressed repeated focal-team observations and paired observations within matches (Cameron et al., 2011; Zeileis et al., 2020) but did not explicitly account for cross-match dependence involving repeated opponent identities or teams appearing in both focal and opponent roles. The $t(47)$ and $F(q, 47)$ reference distributions were approximations without independently established finite-cluster calibration, particularly for multiparameter tests. Failure of the prespecified random-intercept fits does not demonstrate the absence of residual multilevel dependence. Supplementary Material 1, Section S11 documents fitting attempts, covariance settings, inferential approximations and the software environment.

Continuous variables were *z*-standardised using means and standard deviations (SDs) from all 208 observations, with the same constants retained in subset and influence analyses. Incidence rate ratios (IRRs) per 1 SD describe adjusted ratios of expected whole-match counts, with pointwise 95% confidence intervals (CIs). H3 tested whether all five movement coefficients were zero. A separate prespecified contrast tested equality of their standardised coefficients; a joint-model contrast compared the signed coefficients for Offers Made and the proportion. The equal-coefficient comparison concerns coefficients measured per predictor-specific standard deviation. It does not compare equal changes in raw movement counts or establish tactical superiority among movement categories. Holm adjustment covered H1, H2 and H3 at two-sided $\alpha = .05$ (Holm, 1979). Separate Holm families covered the five movement coefficients and the two supporting contrasts. These families addressed, respectively, the primary construct-level hypotheses, category-level descriptions of the movement profile, and planned supporting coefficient comparisons; secondary phase, interaction and alternative-outcome analyses were treated as distinct supporting domains and were not used to strengthen the primary-family conclusions. CIs were pointwise, not simultaneous multiplicity-adjusted intervals.

Sensitivity and secondary analyses

Nine prespecified variants examined exposure measurement, distributional and dependence assumptions, sample restrictions, score-state timing and Elo specification (Supplementary Material 1, Section S7). The dependence variant coincided with the accepted fallback and was not an independent robustness check. Team omissions removed both observations from every match involving the omitted team (48 analyses); match omissions removed each paired match in turn (104 analyses). Legal extreme observations were retained. Supplementary Material 1, Sections S8–S11 provides influence, collinearity, convergence and distributional diagnostics.

Prespecified secondary analyses examined the Build Up, Progression and Final Third phase-panel totals separately, two opponent-context interactions, and Completed Line Breaks, expected goals (xG) and Attempts On Target. Phase panels were not an exhaustive, mutually exclusive partition, and no direct phase comparison was specified. Full interaction terms, outcome models and separate Holm families are retained in Supplementary Material 1, Sections S4–S6; the secondary xG diagnostic limitation is in Supplementary Material 1, Section S12.

RESULTS

All 208 team-match observations entered the primary analyses. Defensive Line Breaks had a median of 9 per team-match (interquartile range 6–13.25; range 1–30), with no zero counts. Table 1 provides the sample, construct and adjustment-variable descriptives.

Table 1. Sample and FIFA-defined construct descriptives.

Construct / variable	*M* (*SD*)	Median (Q1–Q3)	Range
Primary outcome			
Defensive line breaks	10.03 (5.56)	9.00 (6.00–13.25)	1–30
Offering to receive			
Offers made	339.57 (105.85)	333.00 (263.00–421.50)	69–634
Offers received	123.71 (44.10)	119.50 (91.00–156.25)	20–247
The proportion of offers made recorded as offers received	0.360 (0.044)	0.359 (0.333–0.390)	0.247–0.482
Movement to receive			
In front	81.44 (34.29)	78.50 (57.00–106.00)	8–177
In between	66.54 (23.76)	65.00 (51.00–83.25)	10–130
In behind	88.59 (32.08)	86.00 (67.00–108.00)	21–193
In to out	10.65 (4.47)	10.00 (8.00–13.25)	1–26
Out to in	7.86 (4.17)	7.00 (5.00–10.00)	0–26
Exposure and context			
Passes attempted	486.63 (142.89)	479.00 (374.50–584.25)	166–891
Pre-match Elo difference	0.00 (253.04)	0.00 (−195.50–195.50)	−579–579
Time leading (min)	27.38 (34.28)	8.03 (0.00–51.83)	0.00–107.92
Time trailing (min)	27.38 (34.28)	8.03 (0.00–51.83)	0.00–107.92
Match duration (min)	105.65 (10.31)	102.46 (100.59–105.05)	95.44–144.85

Note. All variables: *N* = 208; 48 teams and 104 matches. Group stage: 72 matches/144 observations; knockout: 32/64; extra time: 9/18. Units are whole-match counts except the proportion, Elo and time fields. Score-state timing is approximate; the proportion uses a 0–1 scale. Offers Received is descriptive and supplies the numerator, not an additional primary predictor. Full descriptives and standardisation constants are in Supplementary Material 1, Section S1.

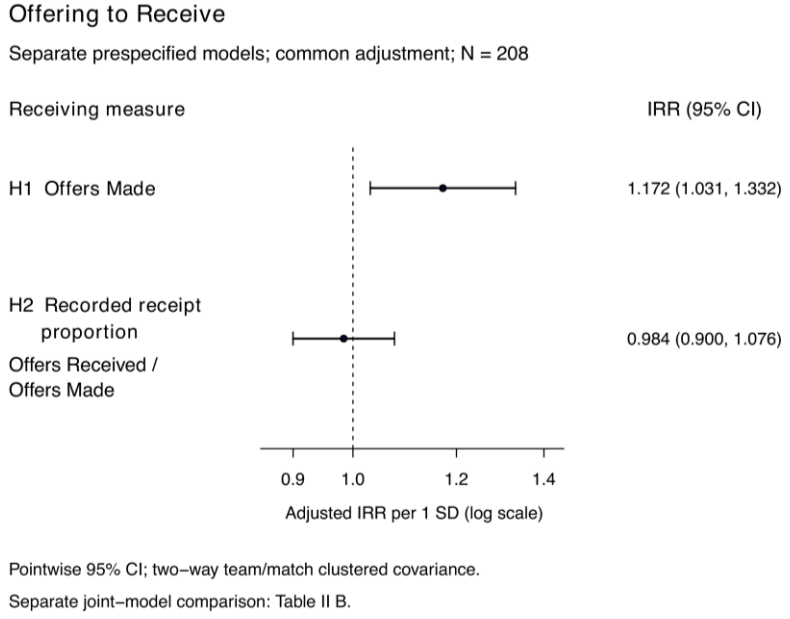


Figure 1. Adjusted association profiles for Offers Made and the proportion of Offers Made recorded as Offers Received. Points and intervals show IRRs per full-sample SD and pointwise 95% CIs from separate prespecified NB2 GLMs. Both models adjust for Passes Attempted, Elo difference, time leading, time trailing, stage and duration, with team/match two-way clustered covariance. The dashed line marks unity. Without an offset, IRRs represent expected whole-match count ratios. The separately fitted joint contrast is reported in Table 2B.

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Offers Made showed a positive adjusted association with Defensive Line Breaks in its prespecified model (IRR = 1.172 per 1 SD, 95% CI [1.031, 1.332]; Holm-adjusted p = .033; Figure 1 and Table 2A).

Table 2. Primary hypotheses and prespecified supporting comparisons.

A. Primary hypothesis family.

Hypothesis	Estimate / test	95% CI	Raw *p*	Holm *p*
H1 Offers made	1.172	[1.031, 1.332]	.016	.033
H2 The proportion of offers made recorded as offers received	0.984	[0.900, 1.076]	.715	.715
H3 Movement to receive block	$F(5, 47) = 6.93$	—	< .001	< .001

B. Prespecified two-test supporting family.

Comparison	Estimate / test	95% CI	Raw *p*	Holm *p*
Joint model: Offers Made − proportion	β difference = 0.163061	[0.013101, 0.313021]	.034	.034
Movement equal-coefficient contrast	$F(4, 47) = 8.21$	—	< .001	< .001

Note. IRRs are per predictor-specific full-sample SD; omnibus tests have no single IRR. NB2 GLMs use team/match two-way HC1 clustered covariance and adjust for Passes Attempted, Elo difference, time leading, time trailing, stage and duration. With no offset, IRRs represent expected whole-match count ratios. CIs are pointwise; Holm correction is separate within Panels A and B. H3 tests five coefficients jointly equal to zero; Panel B tests the signed joint coefficient difference and equality of the five Movement coefficients. The latter is not an all-pairs test, and the former does not rank causal importance. Full coefficients are in Supplementary Material 1, Sections S2–S3.

The point estimate for the proportion of Offers Made recorded as Offers Received remained close to the null (IRR = 0.984, 95% CI [0.900, 1.076]; Holm-adjusted p = .715), providing limited evidence of an adjusted association within this team-match framework. The interval was compatible with modest associations in either direction (Figure 1 and Table 2A).

The Movement to Receive block showed an overall adjusted association with Defensive Line Breaks, $F(5, 47) = 6.93$, primary-family Holm-adjusted p < .001 (Table 2A).

The full movement profile is shown in Figure 2. In FIFA category order, the IRRs were 1.029 (95% CI [0.894, 1.185]) for In Front, 0.969 [0.891, 1.053] for In Between, 1.273 [1.169, 1.387] for In Behind, 0.998 [0.932, 1.068] for In to Out, and 1.005 [0.934, 1.082] for Out to In. The In Behind coefficient was positive (within-block Holm-adjusted p < .001); this estimate is interpreted with the construct-overlap qualification described below. The other four estimates were close to the null, with intervals including unity. All five coefficients and their unadjusted and adjusted p values are reported in Supplementary Material 1, Section S2.

In the joint model, the IRRs were 1.171 (95% CI [1.029, 1.332]) for Offers Made and 0.995 [0.912, 1.085] for the proportion. The prespecified signed coefficient difference was 0.163061 (95% CI [0.013101, 0.313021]; supporting-family Holm-adjusted p = .034; Table 2B and Supplementary Material 1, Section S3). This comparison concerned signed coefficients on their respective 1 SD scales.

The separate prespecified equal-coefficient contrast supported a non-uniform category profile, $F(4, 47) = 8.21$, supporting-family Holm-adjusted p < .001 (Table 2B).

These block and contrast statistics rely on the prespecified two-way HC1 covariance estimator and approximate $F(q, 47)$ reference distributions. Their finite-sample calibration has not been independently established for this particular clustered NB2 specification. The resulting p values should therefore be treated as approximate inferential evidence, with particular caution for multiparameter tests.

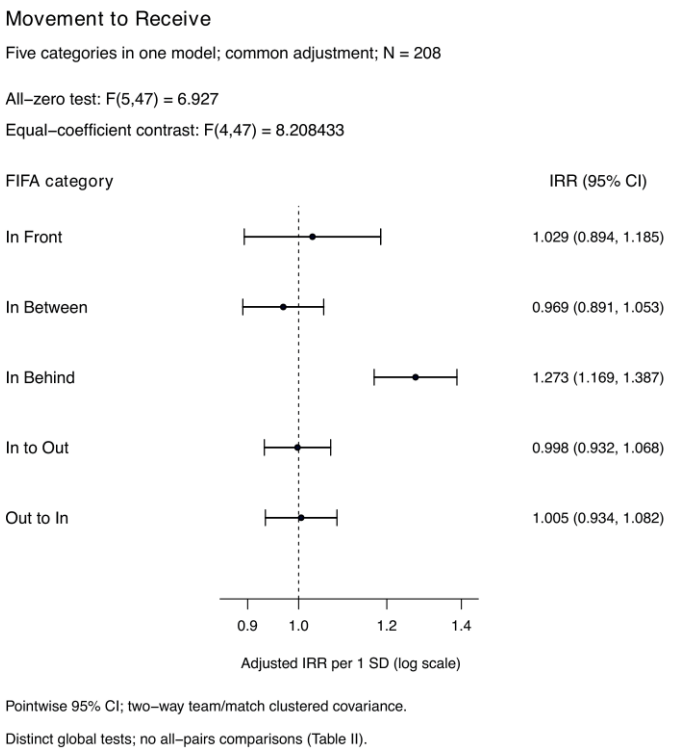


Figure 2. Full adjusted association profile of the five FIFA-defined Movement to Receive categories. All categories entered one NB2 GLM with the common adjustment set and team/match two-way clustered covariance. Points and intervals show IRRs per frozen full-sample SD and pointwise 95% CIs. The primary all-zero test asks whether any category is associated with the outcome; the supporting equal-coefficient contrast asks whether the standardised coefficients are equal (Table 2). Neither establishes all pairwise differences. Full coefficients and within-block Holm *p* values are in Supplementary Material 1, Section S2.

Among the five Movement to Receive counts, the largest pairwise Pearson correlation was $r = .686$ (In Front and In Behind). The H3 predictor matrix was full rank, with a maximum variance inflation factor of 4.491. The complete correlation matrix and individual VIFs are provided in Supplementary Table S27. These diagnostics do not establish independence among the underlying constructs.

Offers Made and In Behind retained positive directions across the nine prespecified variants and all 48 team and 104 match omission analyses. Across the variants, their IRRs ranged from 1.121 to 1.175 and from 1.254 to 1.298, respectively. The group-stage estimate for Offers Made was less precise (1.121, 95% CI [0.955, 1.317]). Some near-null coefficients changed sign around zero, including the proportion, but the prespecified material-change criterion was not triggered. Full estimates, interval behaviour and influence records are provided in Supplementary Material 1, Sections S7–S9.

Both prespecified interaction estimates were close to zero on the log scale: 0.004202 (95% CI [−0.062901, 0.071306]) for In Behind × opponent Mid-Block Defensive Line Height, and −0.003713 [−0.065603, 0.058177] for In Between × opponent Mid-Block percentage. Both Holm-adjusted *p* values were > .999. Conditional estimates provided little additional evidence of variation over the prespecified opponent-context range (Supplementary Material 1, Section S5).

Offers Made remained positively associated with Completed Line Breaks, xG and Attempts On Target, and the movement block retained evidence of an association; category-level support varied across outcomes.

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The proportion estimates were 1.022 (95% CI [0.995, 1.050]), 1.049 [0.954, 1.154] and 1.082 [0.982, 1.191], respectively, with differing uncertainty around unity (Supplementary Material 1, Section S6). The three phase-panel estimates are reported separately in Supplementary Material 1, Section S4; no direct phase contrast was tested. A tail-fit limitation restricted the secondary xG interpretation (Supplementary Material 1, Sections S10–S12).

DISCUSSION

The FIFA-defined receiving measures showed a selective rather than uniform adjusted association profile with Defensive Line Breaks. Offers Made was positively associated with the outcome, whereas the estimate for the proportion recorded as Offers Received was close to unity. The five-category Movement to Receive block showed an overall association and a non-uniform standardised coefficient profile. These findings are primarily informative about measurement: absolute offer volume, relative recorded receipt and movement categories convey distinguishable team-match association patterns and should not be compressed into a single indicator of off-ball effectiveness. They do not establish that these constructs are causally independent.

Offers Made and the recorded receipt proportion retain different information. The count reflects the number of receiving options recorded, while the ratio relates the received count to that volume. The same proportion can arise from very different numbers of offers: a hypothetical team with many offers and moderate recorded receipt and one with fewer offers but a higher proportion have different activity profiles. Neither profile can be labelled more efficient without further validation. In the present analyses, the near-unity proportion estimate concerns its adjusted team-match association with Defensive Line Breaks, not the probability that an individual offer is received. Varying Offers Made denominators also imply unequal underlying count information, which H2 did not explicitly model. The comparison of these measures is therefore a distinction in statistical information, not a judgement about the football value of actual reception.

The five movement categories also should be considered as a profile rather than reduced to a total count. The omnibus test showed an overall association, while the separate equal-coefficient comparison indicated non-uniformity on predictor-specific standard-deviation scales. It did not compare equal raw-count changes, prove every pairwise difference or rank movement types by tactical value. The raw-count correlation matrix and H3 VIFs in Supplementary Table S27 describe a moderately associated predictor system without complete linear dependence. They help characterise conditional model interpretation, but do not establish independence of the underlying football behaviours. Other attacking outcomes and observation levels may yield different movement profiles (Bradley, 2025; Thönnessen et al., 2026; Yang et al., 2026).

In Behind showed a positive category-specific estimate, but its interpretation carries a central measurement-validity limitation. Both In Behind and Defensive Line Breaks refer to the opposition's final defensive unit (FIFA, 2021b, 2021c, 2023). The measures can relate to actions within the same attacking sequence; however, the present aggregated reports do not link an individual offer, movement, reception and line-breaking action, and cannot determine whether a single underlying event contributes to both recorded counts. Shared operational references or source-event overlap could contribute to the association, but the extent of overlap is unknown. Accordingly, the estimate is best interpreted as construct-level convergence within the observed team-match data, not independent predictive evidence that increasing runs in behind generates more line breaks or establishes a superior tactical option.

For applied performance analysis, these measures are most informative when displayed side by side with appropriate context. Offers Made preserves absolute option volume, while the recorded receipt proportion

summarises its relative recorded use; a ratio by itself can conceal large differences in activity volume. Reporting all five movement categories, their model estimates and uncertainty alongside match exposure helps analysts avoid reading a single coefficient as tactical advice. Contrasting a high-volume/moderate-proportion profile with a lower-volume/high-proportion profile is a useful illustration of measurement differences, not an empirically validated coaching standard. A composite off-ball effectiveness score would require independent validation before adoption. The practical contribution is therefore to reporting and interpretation, rather than a recommendation to increase one movement category.

Offers Made and In Behind retained positive directions across the sensitivity and omission analyses, supporting numerical stability within the examined specifications. This does not resolve possible common source-event structure, unmeasured confounding or the direction of any underlying behavioural relationship. One listed sensitivity variant reproduced the accepted model fallback and should not be treated as independent corroboration. The less precise group-stage Offers Made estimate illustrates why directional consistency is not synonymous with consistently precise evidence. These distinctions temper the strength of the inference without altering the original estimates or their accompanying uncertainty.

Several limitations remain. Contemporaneous whole-match aggregates do not establish event sequence or permit causal attribution; territorial location, opponent defensive structure, in-possession time, tactical context and other common causes were not fully measured. Passes Attempted was adjusted for as a proxy for attacking activity, not used as a per-pass opportunity offset, and its role may permit overadjustment under some causal structures. The two-way HC1 covariance and *t*/*F* reference distributions are approximate, particularly for multiparameter tests with 48 teams; cross-match dependence arising from repeated opponents and focal/opponent role changes was not separately modelled. The unsuccessful crossed random-intercept fit does not rule out remaining hierarchical dependence. The analysis plan was frozen after the tournament, before formal effect analysis, rather than publicly preregistered prospectively. Finally, the single-tournament national-team setting and changing reporting practices limit extrapolation to clubs, women's or youth competitions. The secondary xG analysis also carried a documented tail-fit limitation.

Future research needs timestamped event-level linkage between offers, movement, receptions and on-ball penetration to establish their sequence and measure any source-event overlap. Tracking-event integration could also incorporate in-possession time, territorial location, possession sequences and opponent defensive organisation. Replication across competitions should test whether the FIFA-defined constructs remain comparable and whether their association profiles persist in different tactical and competitive contexts; this should be treated as an empirical question rather than assumed generalisability.

CONCLUSIONS

Across the 2026 Men's World Cup, Offers Made showed a positive adjusted team-match association with Defensive Line Breaks, while the estimate for the recorded receipt proportion was close to unity. The Movement to Receive categories exhibited an overall association and non-uniform standardised profile. Although In Behind showed a positive estimate, its shared final-defensive-unit reference with Defensive Line Breaks prevents an independent tactical interpretation without event-linked validation. These findings support reporting option-creation volume, relative recorded receipt and movement categories separately, rather than treating them as a single measure of off-ball effectiveness. The results describe observational team-match associations, not causal effects or tactical rankings.

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AUTHOR CONTRIBUTIONS

All authors meet the criteria for authorship in accordance with established ethical guidelines. Contributions are specified according to the CRediT (Contributor Roles Taxonomy) as follows:

Conceptualisation: Xin Yang. Methodology: Xin Yang. Formal analysis: Xin Yang. Investigation: Xin Yang (data collection); Jitong Chen (literature search/review). Data curation: No separate data-curation role reported. Writing – original draft: Xin Yang. Writing – review & editing: Jitong Chen. Supervision: No separate supervision role reported.

All authors have critically reviewed and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

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CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this manuscript.

DATA AVAILABILITY

The official FIFA Post-Match Summary Reports and World Football Elo Ratings resources can be consulted through the sources cited in this manuscript. The derived 208-row team-match analysis dataset combines information from these third-party sources and has not been deposited publicly because permission for redistribution of the integrated dataset has not been established. The authors retain the frozen statistical input, analytical code, variable definitions, source locators, software-environment records, computational outputs and checksums.

An anonymised 208-observation, reduced-variable reviewer-verification candidate and accompanying analysis code have been prepared and internally checked; they have not been externally distributed and an approved controlled-access mechanism is not yet in place. Requests for shareable author-generated supporting materials may be directed to the corresponding author; any provision remains conditional on actual file availability, third-party rights and appropriate permissions.

Some historical source-index and extraction files were not available for the latest provenance audit, and original retrieval timestamps were not systematically recorded. Complete independent reconstruction from the original online sources has therefore not been demonstrated.

ETHICS AND INFORMED CONSENT

Not applicable. The study used public team-match reports and involved no participant recruitment, intervention or personally identifiable information. The authors confirm that this article does not report any studies involving animals conducted by the authors.

AI USE DISCLOSURE

In accordance with current publishing ethics and transparency recommendations, ChatGPT was used for language polishing. Codex was used for code checking and optimisation. No AI tools were used in the generation of scientific content, including the study design, data collection, analysis, interpretation of results, or the formulation of conclusions. The authors retain full responsibility for the content of the manuscript and confirm its originality, integrity, and accuracy.

REFERENCES

Bradley, P. S. (2025). "Setting the benchmark" part 3: Contextualising the match demands of specialised positions at the FIFA Women's World Cup Australia and New Zealand 2023. *Biology of Sport*, *42*(1), 99–111. https://doi.org/10.5114/biolsport.2025.139857

Brooks, M. E., Kristensen, K., van Benthem, K. J., Magnusson, A., Berg, C. W., Nielsen, A., Skaug, H. J., Mächler, M., & Bolker, B. M. (2017). glmmTMB balances speed and flexibility among packages for zero-inflated generalized linear mixed modeling. *The R Journal*, *9*(2), 378–400. https://doi.org/10.32614/RJ-2017-066

Cameron, A. C., Gelbach, J. B., & Miller, D. L. (2011). Robust inference with multiway clustering. *Journal of Business & Economic Statistics*, *29*(2), 238–249. https://doi.org/10.1198/jbes.2010.07136

de França, E., Branquinho, L., Teixeira, J. E., Forte, P., Ferraz, R., & Thomatieli-Santos, R. (2024). Associations between confederation playing style and team strength in the FIFA World Cup 2022. *Trends in Sport Sciences*, *31*(1), 5–16. https://doi.org/10.23829/TSS.2024.31.1-1

Esposito, F., Bertollo, M., Pompa, D., Angonese, M., & Beato, M. (2026a). Classifying the invisible game: Towards a structured taxonomy of off-the-ball behaviors in football. *International Journal of Sports Science & Coaching*, *21*(3), 1686–1692. https://doi.org/10.1177/17479541261427153

Esposito, F., Bertollo, M., Pompa, D., Angonese, M., & Beato, M. (2026b). Off-the-ball behaviors in elite football using spatiotemporal tracking data: A scoping review. *Science and Medicine in Football*. Advance online publication. https://doi.org/10.1080/24733938.2026.2713521

FIFA. (2021a, November 4). *Offering to receive*. FIFA Training Centre. https://www.fifatrainingcentre.com/en/resources-tools/football-language/in-possession/offering-to-receive/index.php

FIFA. (2021b, November 15). *Movement to receive*. FIFA Training Centre. https://www.fifatrainingcentre.com/en/resources-tools/football-language/in-possession/movement-to-receive/index.php

FIFA. (2021c, November 15). *Unit broken*. FIFA Training Centre. https://www.fifatrainingcentre.com/en/resources-tools/football-language/in-possession/penetrative-action/line-break/unit-broken/index.php

FIFA. (2023, July 11). *Enhanced Football Intelligence: Explanation document* (Version 1.1). https://www.fifatrainingcentre.com/media/native/tournaments/womens-world-cup/2023/FIFA%20Enhanced%20Football%20Intelligence%20%28EFI%29%20Explainations_EN%20v1.1.pdf

FIFA. (2026a). *FIFA World Cup 2026 official match calendar and timeline records* [Data set]. https://api.fifa.com/api/v3/calendar/matches?language=en&count=500&idCompetition=17&idSeason=285023

FIFA. (2026b). *Match report hub: FIFA World Cup 2026™* [Group-stage and knockout-stage reports]. FIFA Training Centre. https://www.fifatrainingcentre.com/en/fifa-world-cup-2026/match-report-hub.php

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Gómez-Jordana, L. I., Amaro e Silva, R., Milho, J., Ric, A., & Passos, P. (2021). Illustrating changes in landscapes of passing opportunities along a set of competitive football matches. *Scientific Reports*, *11*(1), Article 9792. https://doi.org/10.1038/s41598-021-89184-6

Herold, M., Hecksteden, A., Radke, D., Goes, F., Nopp, S., Meyer, T., & Kempe, M. (2022). Off-ball behavior in association football: A data-driven model to measure changes in individual defensive pressure. *Journal of Sports Sciences*, *40*(12), 1412–1425. https://doi.org/10.1080/02640414.2022.2081405

Holm, S. (1979). A simple sequentially rejective multiple test procedure. *Scandinavian Journal of Statistics*, *6*(2), 65–70.

Kang, Y. T., & Che Him, N. (2024). The Poisson regression and quasi-Poisson regression analysis on FIFA World Cup games. *Enhanced Knowledge in Sciences and Technology*, *4*(2), 349–358. https://periodical.uthm.edu.my/index.php/ekst/article/view/14287

Thönnessen, T., Memmert, D., Mews, D., & Wunderlich, F. (2026). Off-ball movement in football: Evidence on the relationship between team strength, performance, success and runs in behind. *International Journal of Performance Analysis in Sport*, *26*(3), 509–524. https://doi.org/10.1080/24748668.2025.2521978

Travassos, B., Monteiro, R., Coutinho, D., Yousefian, F., & Gonçalves, B. (2023). How spatial constraints afford successful and unsuccessful penetrative passes in elite association football. *Science and Medicine in Football*, *7*(2), 157–164. https://doi.org/10.1080/24733938.2022.2060519

Wei, X., Zhao, Y., Chen, H., Krustrup, P., Randers, M. B., & Chen, C. (2024). Are EFI data valuable? Evidence from the 2022 FIFA World Cup group stage. *Biology of Sport*, *41*(1), 77–85. https://doi.org/10.5114/biolsport.2024.127382

World Football Elo Ratings. (2026). *2026 World Cup results and historical ratings*. Retrieved October 9, 2026, from https://www.eloratings.net/2026_World_Cup_results

Yang, T., Feng, L., Ren, D., Cheng, Z., Chen, X., Liu, Y., & Liu, H. (2026). The relationship between penetrative actions and football match outcomes: Evidence from the 2022 FIFA World Cup. *Biology of Sport*, *43*, 1559–1568. https://doi.org/10.5114/biolsport.2026.161107

Zeileis, A., Köll, S., & Graham, N. (2020). Various versatile variances: An object-oriented implementation of clustered covariances in R. *Journal of Statistical Software*, *95*(1), 1–36. https://doi.org/10.18637/jss.v095.i01

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SUPPLEMENTARY MATERIAL 1

Offering to Receive, Movement to Receive and Defensive Line Breaks at the 2026 Men's World Cup.

This supplement provides the construct definitions, complete prespecified results, sensitivity and influence analyses, and diagnostic records. Sections S1–S13, Supplementary Tables S1–S27 and Supplementary Figure 1 are listed below. Tables retain the precision of the frozen manuscript. File paths below refer to the unchanged author-held REPRODUCIBILITY_PACKAGE_v1.0 archive.

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S1 Measures, descriptives and data checks

Supplementary Table S1. FIFA construct definitions and analytical use.

Measure	Source definition and use
Offering to Receive	A deliberate action to present a receiving option before a possible pass. An actual reception is not required (FIFA, 2021a).
Offers Made / Offers Received	Made is the team's recorded offers; Received is the corresponding recorded received count in the official module. Their aggregate proportion is the only derived receiving ratio (FIFA, 2021a, 2026b).
In Front	Movement to receive in front of the first opposition unit, beginning beyond the opposition's first unit or highest attacking player, as specified by FIFA (FIFA, 2021b).
In Between	Movement to receive within or between opposition units, inside the opposition team shape (FIFA, 2021b).
In Behind	Movement to receive beyond the opposition's final defensive unit (FIFA, 2021b).
In to Out / Out to In	Movement from inside to outside, or outside to inside, the opposition's team shape (FIFA, 2021b).
Defensive Line Breaks	PMSR Match Summary count previously matched to completed defensive-unit counts in the Line Breaks panels. Distinct from all Completed Line Breaks; shared last-unit reference with In Behind. The official explanation supplies attempted/completed and unit classification; the selected completed aggregate is established by the 2026 report field chain (FIFA, 2021c, 2023, 2026b).
Opponent Mid-Block Defensive Line Height	Deepest opposition defensive player's distance from their own goal, from the opponent Mid-Block panel, in metres (FIFA, 2023, 2026b).
Opponent Mid-Block percentage	Opponent Mid-Block deployment, expressed as a percentage of their out-of-possession time (FIFA, 2023, 2026b).

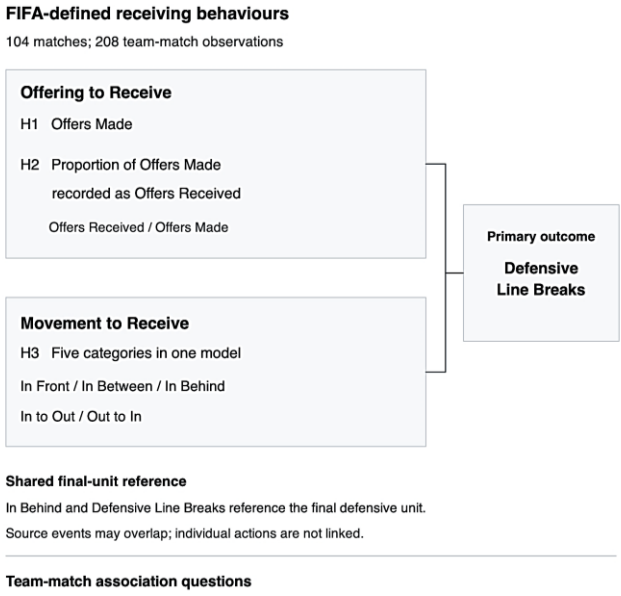
Checks passed for all 208 records: unique team-match identity; paired match/opponent integrity; complete primary fields; Offers Made > 0; Offers Received ≤ Offers Made; agreement between team and summed player totals. Printed player percentages were compatible with the received/made fraction after rounding. These checks establish eligibility for the descriptive team-match proportion. Five movement counts sum to All Movement Types; adding No Movement gives Offers Made. No deterministic total was included with the five counts. The three phase-panel totals are not an exhaustive, mutually exclusive composition.

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Supplementary Table S2. Full descriptive statistics.

Field	*N*	*M* (*SD*)	Median (Q1–Q3)	Range	Zero *N*
Defensive Line Breaks	208	10.03 (5.56)	9.00 (6.00–13.25)	1–30	0
Offers Made / Total Offers Made	208	339.57 (105.85)	333.00 (263.00–421.50)	69–634	0
Offers Received / Total Offers Received	208	123.71 (44.10)	119.50 (91.00–156.25)	20–247	0
the proportion of Offers Made recorded as Offers Received	208	0.360 (0.044)	0.359 (0.333–0.390)	0.247–0.482	0
In Front	208	81.44 (34.29)	78.50 (57.00–106.00)	8–177	0
In Between	208	66.54 (23.76)	65.00 (51.00–83.25)	10–130	0
In Behind	208	88.59 (32.08)	86.00 (67.00–108.00)	21–193	0
In to Out	208	10.65 (4.47)	10.00 (8.00–13.25)	1–26	0
Out to In	208	7.86 (4.17)	7.00 (5.00–10.00)	0–26	2
Passes Attempted (team total)	208	486.63 (142.89)	479.00 (374.50–584.25)	166–891	0
Elo difference	208	0.00 (253.04)	0.00 (−195.50–195.50)	−579–579	0
Time leading	208	27.38 (34.28)	8.03 (0.00–51.83)	0.00–107.92	95
Time trailing	208	27.38 (34.28)	8.03 (0.00–51.83)	0.00–107.92	95
Recorded period elapsed duration	208	105.65 (10.31)	102.46 (100.59–105.05)	95.44–144.85	0
Mid-Block (%)	208	21.36 (7.34)	21.00 (16.00–26.25)	3.00–46.00	0
Defensive Line Height — Mid Block panel	208	37.56 (1.67)	37.00 (36.00–39.00)	34.00–44.00	0
Possession (%)	208	45.55 (11.34)	45.40 (37.00–54.62)	19.20–72.40	0
Pre-match team Elo	208	1833.55 (185.79)	1839.50 (1712.00–1951.75)	1421–2232	0
Pre-match opponent Elo	208	1833.55 (185.79)	1839.50 (1712.00–1951.75)	1421–2232	0
Movement to Receive — Build Up	208	143.73 (61.58)	141.00 (96.75–185.25)	10–352	0
Movement to Receive — Progression	208	83.17 (31.52)	79.00 (62.75–103.00)	14–172	0
Movement to Receive — Final Third	208	72.64 (45.23)	62.00 (40.75–99.25)	2–306	0
Completed Line Breaks	208	92.25 (26.96)	89.50 (72.00–112.25)	23–182	0
xG (Expected Goals)	208	1.28 (0.86)	1.12 (0.61–1.85)	0.02–4.17	0
On Target — Match Summary	208	4.26 (2.89)	4.00 (2.00–6.00)	0–15	9

The frozen outcome-only variance of Defensive Line Breaks was 30.911905 versus a mean of 10.033654. Standardisation constants for every primary and secondary continuous variable are retained in FORMAL_ANALYSIS_SCALING_CONSTANTS.csv; they were never re-estimated within folds. For example, the SDs were 105.852073 for Offers Made, 0.044185333 for the proportion and 32.084614 for In Behind.



Supplementary Figure 1. FIFA-native conceptual domains and the team-match unit of inference. Non-directional links indicate association questions. Offering and Movement were examined in their separate prespecified models with Defensive Line Breaks as the sole primary outcome. In Behind and Defensive Line Breaks share the opposition's final-unit reference; no event-level linkage was available.

S2 Complete Movement to Receive results

Supplementary Table S3. Complete movement to receive coefficients.

Term	β	*SE*	Ratio [95% CI]	Raw *p*	Holm *p*
In Front	0.028608	0.070146	1.029 [0.894, 1.185]	.685	> .999
In Between	−0.031812	0.041601	0.969 [0.891, 1.053]	.448	> .999
In Behind	0.241747	0.042581	1.273 [1.169, 1.387]	< .001	< .001
In to Out	−0.002304	0.034047	0.998 [0.932, 1.068]	.946	> .999
Out to In	0.005208	0.036760	1.005 [0.934, 1.082]	.888	> .999

H3 is the all-zero test of the five coefficients: $F(5, 47) = 6.93$, primary-family Holm $p < .001$. The supporting equal-coefficient test M-HET was $F(4, 47) = 8.21$, raw $p < .001$ and Holm $p < .001$. M-HET and J-COMP comprise a separate family of two tests. They do not establish all pairwise category differences. Each coefficient is on its own frozen 1 SD scale; estimates are not movement rankings.

S3 Joint Offering model and comparison

Supplementary Table S4. Joint offering model coefficients.

Term	β	*SE*	Ratio [95% CI]	Raw *p*	Holm *p*
Offers Made	0.157554	0.064249	1.171 [1.029, 1.332]	.018	—
The proportion of Offers Made recorded as Offers Received	−0.005507	0.043180	0.995 [0.912, 1.085]	.899	—

The joint predictor-only matrix was full rank (9/9), with maximum VIF 4.133308 and condition index 4.439534. Prespecified eligibility required VIF ≤ 5, condition index ≤ 30 and a valid numerical fit. J-COMP compared $\beta_{Made} - \beta_{Proportion}$: 0.163061 (95% CI [0.013101, 0.313021]), raw and supporting-family Holm $p = .034$. Its exponentiated value, 1.177 [1.013, 1.368], is a ratio of two prespecified count ratios, not the IRR of another predictor. Full H1–H3 fixed-effect coefficients are in REPRODUCIBILITY_PACKAGE_v1.0/04_RESULTS/CSV/primary_all_fixed_effects.csv. The full stored joint coefficient vector and covariance are in REPRODUCIBILITY_PACKAGE_v1.0/03_MODELS/JOINT.rds.

S4 Phase-panel secondary analyses

The phase tests used the same exposure and context adjustment as the primary models and formed a separate Holm family of three (Holm, 1979).

Supplementary Table S5. Separate phase-panel associations.

Term	β	*SE*	Ratio [95% CI]	Raw *p*	Holm *p*
Build Up	0.045424	0.063654	1.046 [0.921, 1.189]	.479	.479
Progression	0.233356	0.045664	1.263 [1.152, 1.384]	< .001	< .001
Final Third	0.230818	0.038438	1.260 [1.166, 1.361]	< .001	< .001

Only Build Up, Progression and Final Third panel totals were analysed separately against the whole-match outcome. The three tests share one Holm family. No movement-type × phase cells or phase shares were analysed. No direct contrast between phase coefficients was tested. Different separate-model estimates do not establish between-phase differences or a phase-specific causal process.

S5 Prespecified opponent-context interactions

Both interaction models retained the focal and moderator main effects and the common adjustment set. The two interaction tests formed a separate Holm family.

Supplementary Table S6. Prespecified opponent-context interactions.

Term	β	*SE*	Ratio [95% CI]	Raw *p*	Holm *p*
I1	0.004202	0.033356	1.004 [0.939, 1.074]	.900	> .999
I2	−0.003713	0.030764	0.996 [0.937, 1.060]	.904	> .999

I1: In Behind × opponent Mid-Block Defensive Line Height. I2: In Between × opponent Mid-Block percentage. The table's ratio is the ratio of focal count ratios per 1 SD change in the moderator, rather than an ordinary main-effect IRR. Log-scale estimates were 0.004202 (95% CI [−0.062901, 0.071306]) and −0.003713 [−0.065603, 0.058177], respectively. Both Holm *p* values were > .999. Conditional associations were prespecified and are shown without selecting an interaction by its *p* value.

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Supplementary Table S7. Conditional associations at prespecified moderator anchors.

Interaction	Moderator value	Focal ratio [95% CI]
I1	36 metres in Mid-Block panel	1.272 [1.131, 1.431]
I1	37 metres in Mid-Block panel	1.276 [1.160, 1.403]
I1	39 metres in Mid-Block panel	1.282 [1.166, 1.409]
I2	13 percentage points of opponent out-of-possession time	0.981 [0.874, 1.102]
I2	21 percentage points of opponent out-of-possession time	0.977 [0.899, 1.062]
I2	30.3 percentage points of opponent out-of-possession time	0.973 [0.877, 1.079]

The complete six anchors and two 51-point grids are retained in Supplement_Interaction_Associations.csv. I1 values above 39 m had only 18 observations and were not used for a separate tail interpretation. I2 had a predictor-only maximum VIF of 5.140, a reporting warning; the interaction-term VIF was approximately 1.14. All prespecified terms were retained.

S6 Secondary outcomes

Completed Line Breaks and Attempts On Target used NB2 models; xG used a Gamma model with a log link. The nine hypothesis tests and fifteen movement follow-up coefficients formed separate Holm families.

Supplementary Table S8. Secondary outcome hypotheses.

Outcome / test	Family	Ratio or *F*	95% CI	Raw *p*	Holm *p*
Completed Line Breaks / H1	NB2	1.089	[1.036, 1.144]	.001	.007
Completed Line Breaks / H2	NB2	1.022	[0.995, 1.050]	.104	.312
Completed Line Breaks / H3_GLOBAL	NB2	*F* = 8.198	—	< .001	< .001
xG / H1	Gamma	1.240	[1.085, 1.417]	.002	.011
xG / H2	Gamma	1.049	[0.954, 1.154]	.317	.317
xG / H3_GLOBAL	Gamma	*F* = 4.951	—	.001	.007
Attempts On Target / H1	NB2	1.196	[1.070, 1.337]	.002	.011
Attempts On Target / H2	NB2	1.082	[0.982, 1.191]	.107	.312
Attempts On Target / H3_GLOBAL	NB2	*F* = 6.371	—	< .001	.001

The nine tests form the frozen secondary-outcome Holm family. NB2 outcomes use count ratios; Gamma xG uses mean ratios. Whole-match exposure/context adjustment and dependence handling match the primary framework.

Supplementary Table S9. Complete secondary movement coefficients.

Term	β	*SE*	Ratio [95% CI]	Raw *p*	Holm *p*
Completed Line Breaks / In Front	−0.057371	0.020617	0.944 [0.906, 0.984]	.008	.101
Completed Line Breaks / In Between	0.042239	0.015269	1.043 [1.012, 1.076]	.008	.101
Completed Line Breaks / In Behind	0.048518	0.017144	1.050 [1.014, 1.087]	.007	.096
Completed Line Breaks / In to Out	0.008439	0.010980	1.008 [0.986, 1.031]	.446	> .999
Completed Line Breaks / Out to In	0.031644	0.015481	1.032 [1.001, 1.065]	.047	.466
xG / In Front	0.080670	0.075553	1.084 [0.931, 1.262]	.291	> .999
xG / In Between	−0.011673	0.052812	0.988 [0.889, 1.099]	.826	> .999
xG / In Behind	0.209653	0.054374	1.233 [1.105, 1.376]	< .001	.005
xG / In to Out	−0.029725	0.040903	0.971 [0.894, 1.054]	.471	> .999
xG / Out to In	0.047557	0.053191	1.049 [0.942, 1.167]	.376	> .999
Attempts On Target / In Front	0.048950	0.053948	1.050 [0.942, 1.171]	.369	> .999
Attempts On Target / In Between	0.018124	0.052124	1.018 [0.917, 1.131]	.730	> .999
Attempts On Target / In Behind	0.149051	0.054210	1.161 [1.041, 1.294]	.008	.101
Attempts On Target / In to Out	−0.060977	0.044460	0.941 [0.860, 1.029]	.177	> .999
Attempts On Target / Out to In	0.066609	0.060211	1.069 [0.947, 1.207]	.274	> .999

The fifteen coefficients form a separate Holm family. Category-level support was uneven: the In Behind adjusted *p* values were .096 for Completed Line Breaks, .005 for xG and .101 for Attempts On Target. The xG tail limitation in S12 applies to these estimates. No secondary finding changes the primary hierarchy.

S7 Nine prespecified sensitivity variants

Supplementary Table S10. Prespecified sensitivity variants.

ID	Frozen modification
S1	Possession % in place of Passes Attempted
S2	Poisson with identical dependence handling
S3	Group-stage matches only
S4a	Exclude extra-time matches
S4b	Extra-time indicator in place of duration
S5a	Remove time leading and time trailing
S5b	Nearest-minute coarsening of aggregate score-state durations
S7	Separate team and opponent Elo ratings
S8	Alternative dependence implementation; duplicate of accepted F1

Variant S1 Possession % in place of passes attempted

Supplementary Table S11. Sensitivity variant S1.

Term	IRR [95% CI]	*N*	Direction flip	Material change
H1 Offers Made	1.144 [1.038, 1.261]	208	No	No
H2 proportion	1.001 [0.919, 1.091]	208	Yes	No
In Front	1.033 [0.919, 1.162]	208	No	No
In Between	0.975 [0.896, 1.060]	208	No	No
In Behind	1.258 [1.163, 1.362]	208	No	No
In to Out	0.995 [0.930, 1.064]	208	No	No
Out to In	1.006 [0.935, 1.084]	208	No	No

H3: $F(5, 47) = 8.660$, raw $p < .001$. Sensitivity estimates are stability checks, not a new multiplicity family.

Variant S2 Poisson with identical dependence handling

Supplementary Table S12. Sensitivity variant S2.

Term	IRR [95% CI]	*N*	Direction flip	Material change
H1 Offers Made	1.173 [1.030, 1.336]	208	No	No
H2 proportion	0.977 [0.891, 1.070]	208	No	No
In Front	1.028 [0.887, 1.191]	208	No	No
In Between	0.971 [0.893, 1.057]	208	No	No
In Behind	1.259 [1.158, 1.369]	208	No	No
In to Out	0.996 [0.928, 1.068]	208	No	No
Out to In	1.007 [0.938, 1.081]	208	No	No

H3: $F(5, 47) = 6.680$, raw $p < .001$. Sensitivity estimates are stability checks, not a new multiplicity family.

Variant S3 Group-stage matches only

Supplementary Table S13. Sensitivity variant S3.

Term	IRR [95% CI]	*N*	Direction flip	Material change
H1 Offers Made	1.121 [0.955, 1.317]	144	No	No
H2 proportion	0.961 [0.866, 1.066]	144	No	No
In Front	0.964 [0.828, 1.121]	144	Yes	No
In Between	0.957 [0.847, 1.082]	144	No	No
In Behind	1.280 [1.154, 1.419]	144	No	No
In to Out	0.993 [0.919, 1.073]	144	No	No
Out to In	0.990 [0.910, 1.078]	144	Yes	No

H3: $F(5, 47) = 5.644$, raw $p < .001$. Sensitivity estimates are stability checks, not a new multiplicity family.

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Variant S4a Exclude extra-time matches

Supplementary Table S14. Sensitivity variant S4a.

Term	IRR [95% CI]	*N*	Direction flip	Material change
H1 Offers Made	1.167 [1.009, 1.349]	190	No	No
H2 proportion	0.977 [0.890, 1.073]	190	No	No
In Front	1.008 [0.873, 1.165]	190	No	No
In Between	0.964 [0.882, 1.054]	190	No	No
In Behind	1.298 [1.176, 1.434]	190	No	No
In to Out	0.995 [0.932, 1.064]	190	No	No
Out to In	0.994 [0.927, 1.065]	190	Yes	No

H3: $F(5, 47) = 6.906$, raw $p < .001$. Sensitivity estimates are stability checks, not a new multiplicity family.

Variant S4b Extra-time indicator in place of duration

Supplementary Table S15. Sensitivity variant S4b.

Term	IRR [95% CI]	*N*	Direction flip	Material change
H1 Offers Made	1.172 [1.031, 1.332]	208	No	No
H2 proportion	0.983 [0.899, 1.076]	208	No	No
In Front	1.030 [0.895, 1.185]	208	No	No
In Between	0.971 [0.893, 1.056]	208	No	No
In Behind	1.271 [1.167, 1.385]	208	No	No
In to Out	0.997 [0.931, 1.068]	208	No	No
Out to In	1.005 [0.933, 1.082]	208	No	No

H3: $F(5, 47) = 6.789$, raw $p < .001$. Sensitivity estimates are stability checks, not a new multiplicity family.

Variant S5a Remove time leading and time trailing

Supplementary Table S16. Sensitivity variant S5a.

Term	IRR [95% CI]	*N*	Direction flip	Material change
H1 Offers Made	1.175 [1.038, 1.329]	208	No	No
H2 proportion	0.981 [0.900, 1.069]	208	No	No
In Front	1.019 [0.890, 1.165]	208	No	No
In Between	0.975 [0.894, 1.065]	208	No	No
In Behind	1.254 [1.166, 1.349]	208	No	No
In to Out	0.999 [0.931, 1.073]	208	No	No
Out to In	1.007 [0.938, 1.082]	208	No	No

H3: $F(5, 47) = 8.789$, raw $p < .001$. Sensitivity estimates are stability checks, not a new multiplicity family.

Variant S5b Nearest-minute coarsening of aggregate score-state durations

Supplementary Table S17. Sensitivity variant S5b.

Term	IRR [95% CI]	*N*	Direction flip	Material change
H1 Offers Made	1.172 [1.031, 1.332]	208	No	No
H2 proportion	0.984 [0.900, 1.076]	208	No	No
In Front	1.029 [0.894, 1.185]	208	No	No
In Between	0.969 [0.891, 1.053]	208	No	No
In Behind	1.274 [1.169, 1.388]	208	No	No
In to Out	0.998 [0.932, 1.068]	208	No	No
Out to In	1.005 [0.934, 1.082]	208	No	No

H3: $F(5, 47) = 6.914$, raw $p < .001$. Sensitivity estimates are stability checks, not a new multiplicity family.

Variant S7 Separate team and opponent Elo ratings

Supplementary Table S18. Sensitivity variant S7.

Term	IRR [95% CI]	*N*	Direction flip	Material change
H1 Offers Made	1.171 [1.029, 1.334]	208	No	No
H2 proportion	0.983 [0.901, 1.072]	208	No	No
In Front	1.025 [0.892, 1.178]	208	No	No
In Between	0.966 [0.888, 1.052]	208	No	No
In Behind	1.279 [1.172, 1.396]	208	No	No
In to Out	0.999 [0.934, 1.070]	208	No	No
Out to In	1.002 [0.929, 1.081]	208	No	No

H3: $F(5, 47) = 6.786$, raw $p < .001$. Sensitivity estimates are stability checks, not a new multiplicity family.

Variant S8 Alternative dependence implementation; duplicate of accepted F1

Supplementary Table S19. Sensitivity variant S8.

Term	IRR [95% CI]	*N*	Direction flip	Material change
H1 Offers Made	1.172 [1.031, 1.332]	208	No	No
H2 proportion	0.984 [0.900, 1.076]	208	No	No
In Front	1.029 [0.894, 1.185]	208	No	No
In Between	0.969 [0.891, 1.053]	208	No	No
In Behind	1.273 [1.169, 1.387]	208	No	No
In to Out	0.998 [0.932, 1.068]	208	No	No
Out to In	1.005 [0.934, 1.082]	208	No	No

H3: $F(5, 47) = 6.927$, raw $p < .001$. Sensitivity estimates are stability checks, not a new multiplicity family.

All nine variants were valid, including the prespecified duplicate S8. Offers Made ranged from IRR 1.121 to 1.175, the proportion from 0.961 to 1.001, and In Behind from 1.254 to 1.298. The group-stage Offers Made interval included unity. S5b rounds aggregate leading/trailing times to the nearest minute; it does not bound the error of individual goal timestamps. The frozen material-change threshold was $|\Delta\beta| \geq \log(1.25)$, or a sign reversal with at least one $|\beta| \geq \log(1.25)$; a doubling of log-CI width was a precision warning. These were analyst-defined stability references, not validated minimum important FIFA effects. Full beta, SE, *p* and CI-width fields are in the data annex.

S8 Leave-one-team-out analysis

All 48 team omissions were valid. Each fold removed both rows of every match involving the omitted team. Offers Made ranged from 1.122 to 1.211 and In Behind from 1.240 to 1.304, with no sign reversal. Removing Argentina changed the near-null proportion estimate to 1.022 [0.939, 1.113]. Removing England changed the In Front estimate to 0.978 [0.858, 1.116].

Supplementary Table S20. Leave-one-team-out summary.

Term	Valid folds	IRR range	Sign flips	Material changes
H1 Offers Made	48	1.122–1.211	0	0
H2 proportion	48	0.971–1.022	1	0
In Front	48	0.978–1.068	1	0
In Between	48	0.953–0.988	0	0
In Behind	48	1.240–1.304	0	0
In to Out	48	0.982–1.015	15	0
Out to In	48	0.991–1.023	12	0

The complete fold-by-coefficient records, including all point estimates, intervals, beta, SE, fold sizes and flags, are in Supplement_Influence_All.csv (series S6a); the full paired-fold census is in influence_folds.csv, and all H3 tests are in influence_global.csv. No legal team or match was removed from the primary dataset.

S9 Leave-one-match-out analysis

All 104 paired match omissions were valid. Offers Made ranged from 1.146 to 1.190 and In Behind from 1.251 to 1.292, with no sign reversal. Some near-null movement coefficients crossed zero. The record identifies every omitted match and retains the full seven-coefficient profile.

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Supplementary Table S21. Leave-one-match-out summary.

Term	Valid folds	IRR range	Sign flips	Material changes
H1 Offers Made	104	1.146–1.190	0	0
H2 proportion	104	0.974–0.998	0	0
In Front	104	1.013–1.057	0	0
In Between	104	0.958–0.982	0	0
In Behind	104	1.251–1.292	0	0
In to Out	104	0.988–1.011	17	0
Out to In	104	0.996–1.015	5	0

The complete fold-by-coefficient records, including all point estimates, intervals, beta, SE, fold sizes and flags, are in Supplement_Influence_All.csv (series S6b); the full paired-fold census is in influence_folds.csv, and all H3 tests are in influence_global.csv. No legal team or match was removed from the primary dataset.

The broad INFLUENCE_CONCERN flag was YES because near-zero coefficients changed sign in some folds. The material influence criterion was not triggered, and Offers Made and In Behind were directionally stable. The frozen overall stability classification remains HIGH; it does not imply that every estimate or every interval was separated from the null.

S10 Model and distributional diagnostics

Supplementary Table S22. Accepted primary and joint model diagnostics.

Model	Accepted engine	NB2 θ	Covariance repair	Convergence
PRIMARY_H1	F1	13.6174	No	0
PRIMARY_H2	F1	12.1987	No	0
PRIMARY_H3	F1	18.5248	No	0
JOINT	F1	13.6361	No	0

The accepted primary and joint mean models converged, with valid inferential covariance and no positive-semidefinite repair. There were 498 accepted model records and 504 fit attempts across the frozen execution. Full fixed-predictor collinearity, formula, convergence, eigenvalue and warning records remain in the data annex. The primary predictor-only matrices were full rank; no outcome-based screening was conducted. The covariance scope is specified in S11.

Supplementary Table S23. Primary distributional diagnostics.

Model	Metric	Observed	Frozen simulation 95% range	Outside
PRIMARY_H1	mean	10.034	9.457–10.596	No
PRIMARY_H1	variance	30.912	25.304–41.334	No
PRIMARY_H1	zero_n	0.000	0.000–2.000	No
PRIMARY_H1	maximum	30.000	26.000–46.000	No
PRIMARY_H1	pearson_sum	209.675	166.148–257.863	No
PRIMARY_H2	mean	10.034	9.442–10.635	No
PRIMARY_H2	variance	30.912	25.402–40.980	No
PRIMARY_H2	zero_n	0.000	0.000–2.000	No
PRIMARY_H2	maximum	30.000	26.000–46.000	No
PRIMARY_H2	pearson_sum	212.544	167.529–255.640	No
PRIMARY_H3	mean	10.034	9.510–10.587	No
PRIMARY_H3	variance	30.912	25.918–42.369	No
PRIMARY_H3	zero_n	0.000	0.000–2.000	No
PRIMARY_H3	maximum	30.000	27.000–54.025	No
PRIMARY_H3	pearson_sum	211.446	167.425–254.108	No

These existing diagnostics used 1,000 draws per model. The primary observed mean, variance, zero count, maximum and Pearson summaries lay within their recorded 95% descriptive simulation envelopes. The simulations describe the working marginal distribution; simulated rows do not preserve empirical cluster dependence and do not prove exact model fit or CI coverage. The Poisson sensitivity had dispersion-related warnings. The original residual/fit PDF is retained unchanged in the author-held archive as Supplement_Model_Fit_Diagnostics.pdf.

S11 Prespecified fallback and environment record

The planned crossed random-intercept NB2 models used glmmTMB (Brooks et al., 2017). After the prespecified boundary and unsuccessful retry, the NB2 GLM fallback was applied uniformly to H1, H2, H3 and the joint model, using multiway clustered covariance (Cameron et al., 2011; Zeileis et al., 2020). Full-sample scalar inference used $t(47)$ and Wald block tests used $F(q, 47)$; subset degrees of freedom followed the available cluster counts. The $t(47)$ and $F(q, 47)$ reference distributions were used as approximations; their finite-cluster calibration, particularly for multiparameter tests, was not independently established.

Supplementary Table S24. Primary mixed-model fit attempts.

Model	Attempt / optimizer	Match SD	Scaled gradient	Trigger
PRIMARY_H1	1 / nlminb	0.00003539	0.00025443	Boundary
PRIMARY_H1	2 / BFGS	0.00087105	0.00626247	Boundary + gradient
PRIMARY_H2	1 / nlminb	0.00002869	0.00021903	Boundary
PRIMARY_H2	2 / BFGS	0.00077894	0.00594777	Boundary + gradient
PRIMARY_H3	1 / nlminb	0.00002502	0.00021150	Boundary
PRIMARY_H3	2 / BFGS	0.00029143	0.00246335	Boundary + gradient

The frozen boundary was random-intercept SD < 0.001; the scaled-gradient tolerance was 0.001. P0 used nlminb with 10,000 iteration/evaluation limits and one BFGS retry with 10,000 iterations. F1 used MASS::glm.nb with log link, maxit = 1000, epsilon = 1×10^{-8} and init.theta = 1 (a prespecified retry with init.theta = 10 was available only for numerical failure). Accepted primary NB2 dispersion parameters were finite and inside the prespecified (10^{-6}, 10^{6}) interval. F2, Poisson with the same covariance, was not needed for the primary models.

Two-way inference used sandwich:vcovCL with cluster = list(team_id, match_id), type = HC1, cadjust = TRUE, multi0 = TRUE and fix = TRUE. Team × match intersections contain one observation; multi0 implements the prespecified intersection correction. No primary covariance repair was required. The reference degrees of freedom were min(number of teams, number of matches) − 1: 47 in the full sample and 46 after a team omission. The fallback estimates adjusted expected whole-match counts and does not claim to retain fitted random intercepts. The two-way clustered covariance estimator accounted for repeated observations of the same focal team across matches and for dependence between the paired team observations within each match. It did not introduce a separate opponent-identity cluster across matches or a multi-membership structure for team identity across focal and opponent roles. Potential residual dependence arising from repeated opponent identity or these cross-role appearances was therefore not separately modelled.

The analysis environment was R 4.5.3, platform aarch64-apple-darwin20.0.0; key packages were glmmTMB 1.1.14, TMB 1.9.19, Matrix 1.7.5, MASS 7.3-66 and sandwich 3.1-3. R_SESSION_INFO.txt and R_PACKAGE_LOCK.csv are retained in the author-held archive at REPRODUCIBILITY_PACKAGE_v1.0/05_ENVIRONMENT, with personal installation paths and host identifiers redacted; the recorded software versions are unchanged. The manuscript phase only transcribed the frozen records and rendered figures.

S12 Secondary xG fit limitation

Supplementary Table S25. Secondary xG distributional limitation.

Model	Metric	Observed	Frozen simulation 95% range
SEC_xg_H1	variance	0.742	0.746–1.611
SEC_xg_H1	maximum	4.170	4.682–10.698
SEC_xg_H2	maximum	4.170	4.560–10.520
SEC_xg_H3	variance	0.742	0.791–1.887
SEC_xg_H3	maximum	4.170	4.863–12.946

All three Gamma xG models showed a maximum-value tail discrepancy; variance was also flagged for H1 and H3. Their simulated upper tails were heavier than the observed sample supported. The already frozen working Pearson diagnostic used the appropriate Gamma scale; no estimate was changed by the manuscript phase. These limitations restrict the xG extension and do not reclassify the primary Defensive Line Breaks results. No alternative xG model was fitted.

S13 SAP and source access

Source locators refer to the FIFA match reports and timelines (FIFA, 2026a, 2026b) and strictly pre-match Elo ratings (World Football Elo Ratings, 2026). The source indices distinguish archived identities from live source addresses.

The statistical analysis plan was internally frozen on 10 September 2026 before formal effect analysis; it was not a pretournament plan or prospective public preregistration. The author-held reproducibility archive records the frozen plan, analytical routines,

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coefficient and covariance outputs, software versions and source-index paths. The restricted 208-row team-match input is identified by its checksum and schema but has not been included in an unrestricted external distribution package, because permission to redistribute the integrated third-party-derived dataset has not been established. Raw FIFA reports, timeline snapshots and original Elo tables are not redistributed. Some historical source-index and extraction files listed in the archive registers were not available for the latest independent provenance audit, so end-to-end reconstruction from the published online sources has not been demonstrated.

Supplementary Table S26. Source and analysis-plan access records.

Source access	Contents
06_DOCUMENTATION/FROZEN_SAP/	Frozen plan and seven companion files; historical manifest paths are archive identifiers, not package entry points.
06_DOCUMENTATION/SOURCE_INDEX/PMSR_SOURCE_INDEX.csv	104 report URLs, archive hashes and physical PDF module pages. Reports are obtained from FIFA; no source PDF is distributed.
06_DOCUMENTATION/SOURCE_INDEX/ELO_SOURCE_INDEX.csv	208 team/opponent source mappings, strictly prior dates and source-line references. Original rating tables are excluded.
06_DOCUMENTATION/SOURCE_INDEX/TIMELINE_SOURCE_INDEX.csv	104 FIFA endpoint references and archived identities. Raw snapshots are excluded; approximate score-state timing is retained.
06_DOCUMENTATION/SOURCE_INDEX/DEFINITION_PAGE_INDEX.csv	EFI version/date and definition anchors; the primary count is traced to the 2026 PMSR summary and completed defensive-unit panels.
07_CHECKSUMS/SHA256SUMS.txt	SHA256 identities of package files. The restricted analytic input identity is in 01_DATA/DATA_ENTRY.json.

Source paths, identifiers and hashes document provenance, but should not be taken to certify that every historical source-index or extraction file is currently included in an externally accessible package. Local file modification times in historical indices are metadata, not original retrieval timestamps; those timestamps were not systematically recorded. Public FIFA match reports and Elo pages can be located using the cited sources, while live endpoints may change. The authors retain code, environment specifications, archived result records and reconstruction instructions; requests for shareable author-generated materials can be considered through the corresponding author, subject to verified file availability and applicable third-party permissions. No permission to redistribute the consolidated observation-level dataset has been established. A 208-observation, 16-column primary-model verification candidate has been assembled and internally checked; it is not a publicly available dataset, and neither access eligibility nor a reviewer-only delivery mechanism has been approved. The EFI Explanation Document is dated 11 July 2023, version 1.1; its physical PDF page 9 (printed page 8) addresses Line Breaks and page 11 (printed page 10) addresses Defensive Line Height. Offering and Movement definitions are supplied by the cited Football Language pages (FIFA, 2021a, 2021b).

Supplementary Table S27. Movement-count correlations and predictor-design diagnostics.

Movement type	*M* (*SD*)	1	2	3	4	5	VIF in H3
1. In Front	81.44 (34.29)	—	.569	.686	.252	.436	3.725
2. In Between	66.54 (23.76)	.569	—	.558	.413	.562	2.188
3. In Behind	88.59 (32.08)	.686	.558	—	.170	.396	2.637
4. In to Out	10.65 (4.47)	.252	.413	.170	—	.265	1.284
5. Out to In	7.86 (4.17)	.436	.562	.396	.265	—	1.548

Values describe 208 team-match observations from 104 matches involving 48 teams. Pearson correlations use the five original movement counts; no correlation significance tests were performed. SD is the sample standard deviation. VIFs are unweighted predictor-design diagnostics from the complete H3 specification, including its six adjustment terms. The maximum full-design VIF was 4.491 for H3 and 4.133 for JOINT (Passes Attempted in both). These diagnostics do not establish independence among the underlying constructs.

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