

Age-related associations in worst-case-scenario running performance among Chinese Super League football players

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Research Article

Keywords: Ageing, Association football, Worst-case scenario, Peak locomotor demands, Match analysis

Posted Date: September 25th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10703916/v1>

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Additional Declarations: No competing interests reported.

Abstract

Background

Worst-case-scenario (WCS) analysis characterises short passages with the highest external locomotor demands. Age-related associations in WCS running performance among professional male football players in the Chinese Super League remain insufficiently described.

Methods

This retrospective observational study included 11,956 player-match observations from 1,030 Chinese Super League matches played during the 2017–2021 seasons. Twelve outcomes were derived from high-intensity-running-distance-defined 1-, 3- and 5-min rolling windows. Poisson generalised linear mixed models adjusted for match location, relative team ranking and match outcome, and included a player random intercept.

Results

In the pooled sample, the simulation-based reporting rule retained quadratic turning points for 1-min high-intensity running distance and high-intensity efforts at 25.1 and 25.3 years, respectively. Position-stratified models retained turning points for 8 of 60 position-outcome combinations, ranging from 25.9 to 28.7 years. Remaining outcomes were summarised using fitted linear contrasts, with negative estimates tending to be larger for longer windows; no age by window-duration interaction was fitted.

Conclusions

Because positions were modelled separately, positional patterns are descriptive rather than formal between-position contrasts. Turning-point uncertainty was based on an approximate coefficient-based simulation and should not be interpreted as an exact biological threshold. These cross-sectional estimates cannot establish within-player ageing and should not be used alone to prescribe training loads or player deployment.

Introduction

Worst-case scenario (WCS) analysis identifies short-duration passages with the highest external locomotor demands, which may be obscured by whole-match averages (Sheppy et al. 2020; Fereday et al. 2020). Rolling-window methods are commonly used to quantify these passages and generally yield higher peak estimates than fixed discrete epochs (Fereday et al. 2020; Riboli et al. 2021). WCS outcomes describe external running demands and do not directly measure physiological strain, tactical quality or match success.

Age-related patterns have been reported for whole-match running performance in professional football. Cross-sectional and longitudinal studies indicate that several locomotor outcomes peak in early adulthood or decline across later playing ages, although the estimated form and timing vary by outcome, sample and analytical design (Sal de Rellán Guerra et al. 2019; Zhou et al. 2020; Rey et al. 2022, 2023; Cao et al. 2024). These whole-match findings cannot be assumed to apply to short WCS periods, which capture a distinct component of match activity.

Evidence on age and peak locomotor demands remains limited. Baptista et al. (2023) compared age groups in women's elite football using full-match and 1-min peak locomotor measures, but examined match-to-match variability rather than directly modelling age-related differences in WCS levels. WCS studies have also shown that peak demands depend on window duration and playing position, including in the Chinese Super League (Martin-Garcia et al. 2018; Riboli et al. 2021; Fang et al. 2025). However, age-related associations in WCS running performance among professional male players in the Chinese Super League remain insufficiently described.

This study therefore aimed to estimate age-related associations in high-intensity-running-distance-defined WCS outcomes in the pooled Chinese Super League sample and to describe position-stratified estimates. We expected limited evidence of non-linearity in selected outcomes and interpreted position-stratified patterns descriptively because no position $\times$ age interaction model was fitted.

Materials and methods

Study design and data source

This retrospective observational study examined age-related associations in WCS running performance among professional male football players. The dataset comprised all 1,030 Chinese Super League matches played across the five 2017–2021 seasons. Match-running data were captured with a semi-automatic multi-camera tracking system (STATS Pro, Sport-Universal Process, Nice, France). Previous work has described the use of the AMISCO/STATS family of systems and reviewed computerised multi-camera tracking in elite football (Zubillaga et al. 2008; Castellano et al. 2014). Ethical approval was granted by the Ethics Committee of the School of Physical Education and Sports Science at South China Normal University (SCNU-SPT-2024-070).

Participants

Players were eligible if they (1) started and completed a full match and (2) completed at least one such match in at least two of the five seasons. The second criterion ensured observations at more than one chronological age for each included player. The PlayerID random intercept accounted for correlation among repeated observations, but the analysis did not separate within-player ageing from between-player age differences. The final dataset comprised 11,956 observations from 624 players, who were categorised into five positional groups (Di Salvo et al. 2007):

- Central Defenders (CD): 125 players, 3,226 match observations (mean age: 28.3 ± 3.9 years; range: 17.9–40.8 years).
- Full Backs (FB): 115 players, 2,531 observations (mean age: 28.1 ± 3.2 years; range: 20.0–39.8 years).
- Central Midfielders (CM): 153 players, 2,981 observations (mean age: 29.4 ± 3.1 years; range: 19.0–41.3 years).
- Wide Midfielders (WM): 121 players, 1,230 observations (mean age: 27.8 ± 3.3 years; range: 20.1–35.3 years).
- Forwards (FW): 110 players, 1,988 observations (mean age: 28.8 ± 3.5 years; range: 17.6–40.5 years).

Procedure and variables

The 1-min, 3-min and 5-min WCS for each player-match observation were identified as the epochs with the greatest high-intensity running distance ($v \geq 5.5 \text{ m} \cdot \text{s}^{-1}$) using a rolling-average approach. The regulation-time match timeline was divided into 90 consecutive one-minute clock-time segments. Within each segment, running recorded during dead-ball periods was excluded. Rolling averages were calculated over consecutive segments for each window duration, separately within each half, and did not cross half-time. Added time was not analysed. All four outcomes were extracted from the same HIRD-defined epoch and therefore describe the WCS for high-intensity running rather than each outcome's independently selected peak epoch.

Consistent with prior research, four parameters were selected to quantify the running performance of players during the WCS (Fereday et al. 2020; Riboli et al. 2021; Baptista et al. 2020; Martin-Garcia et al. 2018): total distance (TD), high-intensity running distance (HIRD) at speeds $\geq 5.5 \text{ m} \cdot \text{s}^{-1}$, high-intensity efforts (HIE), and sprinting distance (SprintD) at speeds $\geq 7 \text{ m} \cdot \text{s}^{-1}$. Each parameter was analysed over three epoch windows (1-min, 3-min, and 5-min), yielding 12 variables denoted by parameter and epoch (e.g. TD1min, TD3min, TD5min).

Players' age in years on the match day, match location (home, away, or neutral), team and opponent strength (end-of-season ranking), and match outcome (win, draw, or loss) were recorded as independent variables. When an outcome was undefined because no qualifying effort was recorded, it was retained as missing rather than recoded as zero. Analyses therefore used outcome-specific valid observations.

Statistical analysis

Analyses were conducted in SAS® OnDemand for Academics using PROC GLIMMIX. We fitted 72 models, comprising 12 WCS outcomes in the pooled sample and within each of five positions. These analyses were exploratory multiple estimates, and no multiplicity adjustment was applied. Models included match location, Log2RankDiff (log2 of team rank divided by opponent rank), match outcome, and linear and quadratic match-day age. Age was standardised to a mean of 0 and an SD of 0.5 and

named Year in the SAS code; Year*Year denotes squared standardised age. Each model used a Poisson distribution and log link, with a PlayerID random intercept and a residual random effect. No position-by-age interactions were fitted, so position-specific estimates do not formally compare positions. Diagnostic results and sensitivity analyses using alternative distributions or clustering structures were not reported; estimates should therefore be interpreted as conditional on the specified model.

Turning points were calculated only when the fitted quadratic curvature was negative and the maximum fell within the observed age range. We used 10,000 coefficient-based simulations based on fitted estimates and covariance-related quantities. Turning-point ages are reported as simulated medians with approximate 90% simulation half-widths from the 5th and 95th percentiles. A turning point was retained only when more than 90% of simulations preserved the curvature direction and yielded an interpretable value. Failure to meet this rule does not establish a linear association.

When no stable turning point was retained, the association was summarised by the model-based log-scale contrast between ages corresponding to -1 and $+1$ SD of chronological age. Linear effects were standardised by dividing this contrast by a model-derived between-match SD on the log scale. This SD incorporated the PlayerID random-intercept variance and the overdispersion-adjusted sampling variance at the predicted mean for the -1 SD reference. Confidence limits used the same denominator. Magnitudes were described as trivial (< 0.2), small ($0.2-0.6$), moderate ($0.6-1.2$), large ($1.2-2.0$) or very large (> 2.0). These labels were descriptive only; no probability labels or binary significance decisions were used. Chronological age was analysed, whereas biological maturation, training age and injury history were not measured.

Results

Descriptive statistics for the WCS outcomes are presented in Table I. Mean values per minute decreased as epoch duration increased. CD had the lowest descriptive mean in each outcome, but no formal between-position comparison was performed.

Across the 11,956 match observations, valid n ranged from 10,858 for HIE1min to 11,828 for TD5min in the pooled sample. Undefined observations were retained as missing and were not recoded as zero; therefore, descriptive means and model estimates are based on outcome-specific valid observations.

Age-related associations from the primary model specification are presented in Table II. In the pooled sample, the reporting rule retained quadratic turning points for HIRD1min and HIE1min, with estimated ages of 25.1 and 25.3 years, respectively (Fig. 1). No stable turning point was retained for the other pooled outcomes; this does not establish that their underlying associations were strictly linear. Alternative outcome-distribution and clustering specifications were not examined in this report.

Position-stratified models retained turning points for 8 of 60 position–outcome combinations: CD HIRD1min; FB HIRD1min and SprintD1min; WM HIRD1min, HIRD3min, HIE1min and HIE3min; and FW HIE1min. Estimated ages ranged from 25.9 to 28.7 years, and none was retained for CM (Table II; Fig. 1).

Because the models were fitted separately, these patterns do not demonstrate statistical differences between positions.

In the pooled sample, nine outcomes had negative linear estimates of small, standardised magnitude (ES range, -0.21 to -0.38), while SprintD1min had a trivial negative estimate (ES = -0.14). HIRD1min and HIE1min were represented by retained turning point estimates rather than linear contrasts in Table II (Fig. 2).

Position-specific linear estimates were generally trivial to small. TD3min, TD5min and HIE5min had small negative estimates in CD, FB, CM and FW, whereas the corresponding WM estimates were trivial; FW had the largest negative HIE5min estimate (ES = -0.34). All 12 CM estimates were negative, but their magnitudes remained trivial to small (Table II).

Discussion

This study found heterogeneous age-related associations across WCS outcomes. The simulation-based rule retained pooled turning points only for HIRD1min and HIE1min, whereas several TD and longer-window outcomes had small negative linear estimates. Position-stratified models retained turning points for 8 of 60 combinations, but these patterns are descriptive because no position $\times$ age interaction was fitted. The findings therefore provide limited support for non-linearity and do not identify position-specific age thresholds. The two pooled turning-point estimates were similar and occurred only for 1-min outcomes. Their approximate 90% simulation intervals overlapped, so the numerical difference between 25.1 and 25.3 years should not be interpreted as evidence of materially different peak ages. Each value was the maximum of a fitted quadratic function within the observed age range, rather than a directly observed biological peak. The approximate coefficient-based simulation and reporting rule further limit the precision with which a specific peak age can be inferred.

The position-stratified models showed heterogeneous within-position patterns. Retained turning points ranged from 25.9 to 28.7 years in CD, FB, WM and FW, whereas none was retained in CM. These estimates may be compatible with differences in positional running demands, but role-related mechanisms were not measured and the separate models do not support formal between-position inference. WM showed a mixed descriptive pattern, with retained turning points for HIRD1min, HIRD3min, HIE1min and HIE3min, and mostly trivial linear estimates for the remaining outcomes. This pattern may reflect the smaller WM sample, its narrower observed age range ($n = 1,230$; 20.1–35.3 years), or selective retention of players able to maintain performance. CM was the only position without a retained turning point, and all 12 linear estimates were negative but modest (ES, -0.05 to -0.29). CM should therefore not be characterised as the position most affected by age. The absence of a retained turning point may reflect the distribution of observed ages within this position, but this possibility was not formally evaluated. These position-specific interpretations should therefore remain hypothesis-generating.

Several sustained-running indicators, particularly TD and longer-window outcomes, had negative linear estimates across the observed age range. This pattern is compatible with reports of age-related

reductions in whole-match total and high-intensity running in elite football (Lorenzo-Martinez et al. 2021; Rey et al. 2022). However, differences in samples and methods limit direct comparison, and the cross-sectional analysis cannot distinguish within-player ageing from cohort differences, selection or playing opportunity. Comparisons with Baptista et al. (2023) are also limited because that study examined age-group differences in the variability of full-match and 1-min peak locomotor measures in women's elite football, whereas the current analysis estimated age-related associations in HIRD-defined outcomes among men's CSL full-match observations.

Across separately fitted models, negative linear estimates tended to be larger for 5-min than for 1-min windows when linear contrasts were reported. This descriptive pattern may be compatible with a stronger association of age with sustained output, but no age $\times$ window-duration interaction was fitted. The comparison is not symmetric because HIRD1min and HIE1min were represented by turning points rather than linear contrasts. It is also affected by outcome-specific missingness, which was greater for 1-min than for 5-min outcomes. Rolling-window methods and the selected duration range further limit comparisons with other WCS studies (Fereday et al. 2020; Riboli et al. 2021).

These findings should be interpreted cautiously. Cross-sectional data from starters who completed full matches cannot distinguish within-player ageing from between-player differences, may overrepresent selected survivors, and do not generalise to substitutes or players who were replaced (Dendir 2016; Kalen et al. 2019). Differentially undefined outcomes, particularly for 1-min windows (8.1–9.2% versus 1.1–3.1% for 5-min windows), may also have affected comparability across outcomes and window durations. The 72 exploratory models, approximate turning-point intervals and absence of formal position- or window-duration interaction tests limit inferential precision. Finally, estimates are conditional on the specified Poisson/log-link mixed-model structure, for which diagnostic and sensitivity-analysis results were not reported. Therefore, the findings are descriptive and cannot support causal, individual-level or within-player ageing conclusions.

These findings should not be used alone to prescribe training loads, guide selection or determine player deployment. They may provide provisional descriptive reference profiles at the group level, by position, outcome and window duration, but not validated age thresholds for individual players. Current performance, training status, injury history and match context remain essential for individual decision-making. Longitudinal validation, formal interaction models and robustness assessment under alternative outcome-distribution and correlation specifications are required.

Conclusion

Age-related associations in HIRD-defined WCS running performance were heterogeneous in Chinese Super League match observations. In the pooled sample, retained turning points were limited to HIRD1min and HIE1min at 25.1 and 25.3 years, whereas several longer-window outcomes showed small negative linear estimates. Position-stratified models retained turning points in 8 of 60 combinations but did not formally test between-position differences. These model-dependent, descriptive estimates apply

to players who completed full matches and cannot establish within-player ageing trajectories, biological thresholds or causal mechanisms.

Abbreviations

CD
central defenders
CM
central midfielders
ES
effect size
FB
full backs
FW
forwards
HIE
high-intensity efforts
HIRD
high-intensity running distance
SD
standard deviation
SprintD
sprinting distance
TD
total distance
WCS
worst-case scenario
WM
wide midfielders.

Declarations

Acknowledgements

We greatly appreciate the technical support provided by Wang Tao, Liu Da, and Zhang Bing.

Authors' contributions

ZF: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing - original draft, Writing - review and editing. MAG: Formal analysis, Methodology, Writing - review and editing. SQ: Data

curation, Investigation, Writing - review and editing. LF: Data curation, Investigation, Writing - review and editing. HL: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Writing - original draft, Writing - review and editing. All authors read and approved the final manuscript.

Ethics approval and consent to participate

This study was conducted in accordance with the principles outlined in the Declaration of Helsinki and received approval from the Ethics Committee of the School of Physical Education & Sports Science at South China Normal University (Approval Number: SCNU-SPT-2024-070). The requirement for informed consent was waived by the committee because the study used non-sensitive professional roster data and involved no direct interaction with participants.

Consent for publication

Not applicable. This manuscript does not contain any identifiable individual data, images, or personal information requiring publication consent.

Availability of data and materials

The datasets generated and analysed during the current study are provided in the supplementary files accompanying this article.

Funding

This work was supported by the Sports Performance Analysis and Training Scientific Innovation Team (grant number 2024WCXTD030).

Competing interests

The authors declare that they have no competing interests.

Clinical trial

Clinical trial number: not applicable

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Tables

Table 1
Descriptive statistics for running performance during WCS

Variable	ALL	CD	FB	CM	WM	FW
TD1min ($\text{m}\cdot\text{min}^{-1}$)	179.1 $\pm$ 23.4	167.6 $\pm$ 23.2	182.4 $\pm$ 22.3	186.3 $\pm$ 20.7	187.4 $\pm$ 21.4	178.1 $\pm$ 22.5
TD3min ($\text{m}\cdot\text{min}^{-1}$)	149.7 $\pm$ 18.1	140.0 $\pm$ 16.9	151.1 $\pm$ 17.0	157.0 $\pm$ 16.8	156.0 $\pm$ 16.4	148.6 $\pm$ 17.1
TD5min ($\text{m}\cdot\text{min}^{-1}$)	144.7 $\pm$ 16.7	135.4 $\pm$ 15.1	145.1 $\pm$ 15.1	152.6 $\pm$ 15.8	151.3 $\pm$ 15.0	143.8 $\pm$ 15.7
HIRD1min ($\text{m}\cdot\text{min}^{-1}$)	84.1 $\pm$ 32.3	76.8 $\pm$ 32.9	88.9 $\pm$ 31.8	84.4 $\pm$ 31.8	87.5 $\pm$ 31.2	86.9 $\pm$ 31.4
HIRD3min ($\text{m}\cdot\text{min}^{-1}$)	44.0 $\pm$ 15.5	38.0 $\pm$ 14.8	46.6 $\pm$ 14.8	44.9 $\pm$ 15.6	47.4 $\pm$ 15.1	46.9 $\pm$ 14.8
HIRD5min ($\text{m}\cdot\text{min}^{-1}$)	33.9 $\pm$ 11.7	28.3 $\pm$ 10.7	36.2 $\pm$ 11.0	34.7 $\pm$ 11.7	36.9 $\pm$ 11.2	36.8 $\pm$ 11.3
HIE1min ($\text{n}\cdot\text{min}^{-1}$)	3.5 $\pm$ 1.7	3.2 $\pm$ 1.7	3.6 $\pm$ 1.6	3.5 $\pm$ 1.7	3.7 $\pm$ 1.7	3.6 $\pm$ 1.7
HIE3min ($\text{n}\cdot\text{min}^{-1}$)	2.2 $\pm$ 0.9	1.9 $\pm$ 0.9	2.4 $\pm$ 0.9	2.3 $\pm$ 0.9	2.4 $\pm$ 0.9	2.4 $\pm$ 0.9
HIE5min ($\text{n}\cdot\text{min}^{-1}$)	1.8 $\pm$ 0.7	1.5 $\pm$ 0.6	1.9 $\pm$ 0.7	1.9 $\pm$ 0.7	2.0 $\pm$ 0.7	1.9 $\pm$ 0.7
SprintD1min ($\text{m}\cdot\text{min}^{-1}$)	54.4 $\pm$ 27.5	49.7 $\pm$ 26.8	58.3 $\pm$ 27.1	52.8 $\pm$ 27.6	55.6 $\pm$ 27.5	58.6 $\pm$ 27.4
SprintD3min ($\text{m}\cdot\text{min}^{-1}$)	22.5 $\pm$ 10.7	19.7 $\pm$ 10.0	24.3 $\pm$ 10.4	21.7 $\pm$ 10.7	23.4 $\pm$ 10.7	25.1 $\pm$ 10.8
SprintD5min ($\text{m}\cdot\text{min}^{-1}$)	15.1 $\pm$ 7.3	12.9 $\pm$ 6.7	16.6 $\pm$ 7.1	14.4 $\pm$ 7.1	16.2 $\pm$ 7.4	17.3 $\pm$ 7.4
Note: values are mean $\pm$ SD of match observations. The number of valid observations differs between parameters because a parameter was undefined when no qualifying effort was recorded. Undefined observations were treated as missing and were not recoded as zero.						

Table 2
Associations between match-day age and WCS running performance

Variable	ALL		CD		FB	
	Peak age	Linear estimate	Peak age	Linear estimate	Peak age	Linear estimate
TD1min (m·min ⁻¹)		-0.21 ± 0.07		-0.09 ± 0.13		-0.15 ± 0.11
TD3min (m·min ⁻¹)		-0.34 ± 0.07		-0.23 ± 0.15		-0.3 ± 0.13
TD5min (m·min ⁻¹)		-0.38 ± 0.08		-0.26 ± 0.15		-0.31 ± 0.13
HIRD1min (m·min ⁻¹)	25.1 ± 2.7		27.8 ± 7.5		26.7 ± 2.7	
HIRD3min (m·min ⁻¹)		-0.25 ± 0.06		-0.14 ± 0.11		-0.16 ± 0.11
HIRD5min (m·min ⁻¹)		-0.37 ± 0.07		-0.2 ± 0.13		-0.2 ± 0.11
HIE1min (n·min ⁻¹)	25.3 ± 3.6			0.02 ± 0.07		-0.12 ± 0.08
HIE3min (n·min ⁻¹)		-0.24 ± 0.06		-0.16 ± 0.1		-0.14 ± 0.09
HIE5min (n·min ⁻¹)		-0.38 ± 0.07		-0.2 ± 0.12		-0.29 ± 0.1
SprintD1min (m·min ⁻¹)		-0.14 ± 0.05		-0.05 ± 0.09	25.9 ± 3	
SprintD3min (m·min ⁻¹)		-0.23 ± 0.06		-0.08 ± 0.10		-0.16 ± 0.1
SprintD5min (m·min ⁻¹)		-0.24 ± 0.07		-0.11 ± 0.11		-0.18 ± 0.11
Variable	CM		WM		FW	
	Peak age	Linear estimate	Peak age	Linear estimate	Peak age	Linear estimate
Peak age is presented as the simulated median ± approximate 90% simulation half-width. Linear estimates are standardised age effects presented as the estimate ± 90% confidence-limit half-width. Blank peak-age cells indicate that the simulation-based stability rule was not met; the corresponding fitted linear contrast is shown for descriptive summarisation and does not demonstrate linearity. Magnitude thresholds are descriptive, and no qualitative likelihood or binary significance labels were used.						

Variable	ALL		CD		FB	
	Peak age	Linear estimate	Peak age	Linear estimate	Peak age	Linear estimate
TD1min (m·min ⁻¹)		-0.11 ± 0.12		-0.01 ± 0.16		-0.31 ± 0.14
TD3min (m·min ⁻¹)		-0.28 ± 0.12		-0.14 ± 0.16		-0.2 ± 0.15
TD5min (m·min ⁻¹)		-0.25 ± 0.13		-0.1 ± 0.18		-0.31 ± 0.16
HIRD1min (m·min ⁻¹)		-0.07 ± 0.09	26.8 ± 4.7			-0.15 ± 0.1
HIRD3min (m·min ⁻¹)		-0.18 ± 0.11	27.9 ± 5.1			-0.22 ± 0.12
HIRD5min (m·min ⁻¹)		-0.29 ± 0.12		-0.02 ± 0.15		-0.32 ± 0.14
HIE1min (n·min ⁻¹)		-0.11 ± 0.08	28.7 ± 3.1		25.9 ± 4.5	
HIE3min (n·min ⁻¹)		-0.18 ± 0.1	28.3 ± 5.9			-0.3 ± 0.12
HIE5min (n·min ⁻¹)		-0.24 ± 0.11		0.05 ± 0.15		-0.34 ± 0.14
SprintD1min (m·min ⁻¹)		-0.05 ± 0.09		-0.17 ± 0.13		-0.24 ± 0.13
SprintD3min (m·min ⁻¹)		-0.18 ± 0.11		-0.09 ± 0.15		-0.32 ± 0.13
SprintD5min (m·min ⁻¹)		-0.12 ± 0.12		-0.16 ± 0.16		-0.33 ± 0.14
Peak age is presented as the simulated median ± approximate 90% simulation half-width. Linear estimates are standardised age effects presented as the estimate ± 90% confidence-limit half-width. Blank peak-age cells indicate that the simulation-based stability rule was not met; the corresponding fitted linear contrast is shown for descriptive summarisation and does not demonstrate linearity. Magnitude thresholds are descriptive, and no qualitative likelihood or binary significance labels were used.						

Figures

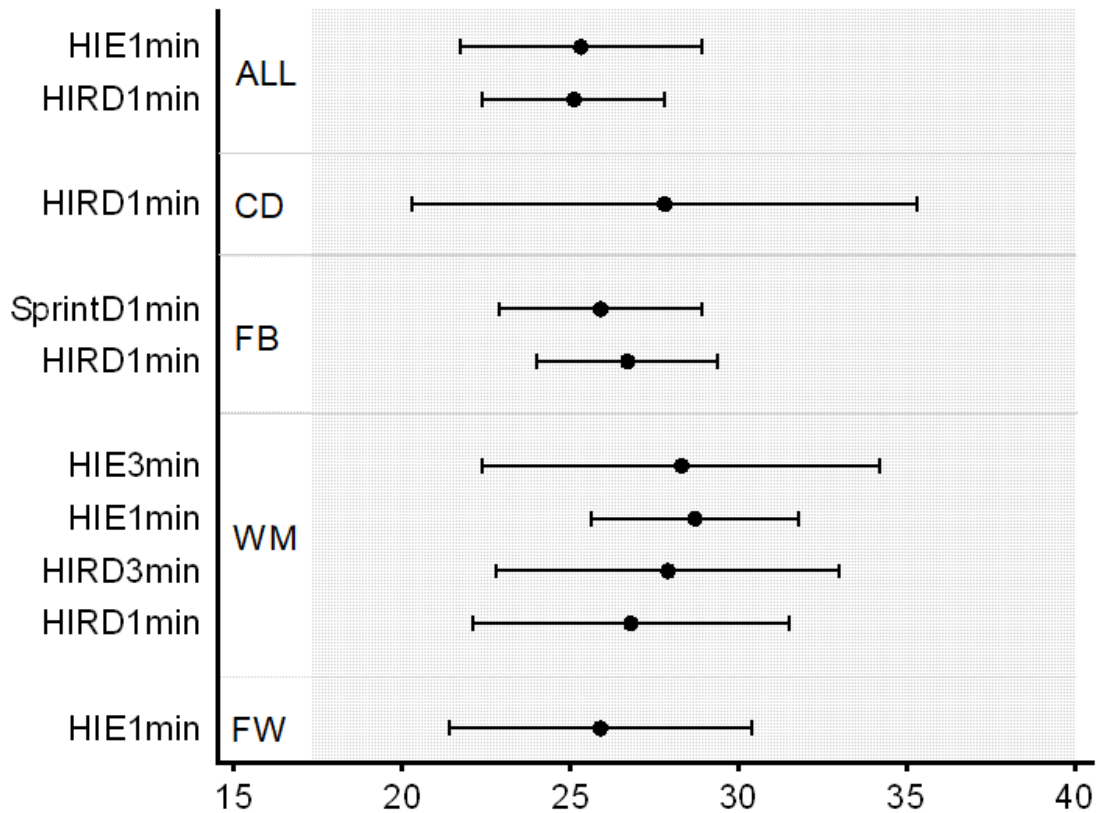


Figure 1

Reported pooled-sample quadratic turning-point ages across WCS window durations. Points show simulated median peak ages, and horizontal bars show approximate 90% simulation half-widths; pale bands indicate the observed age range for each group. Only peak ages meeting the simulation-based reporting rule are displayed. Position-stratified estimates were derived from separate models and are not formal between-position contrasts.

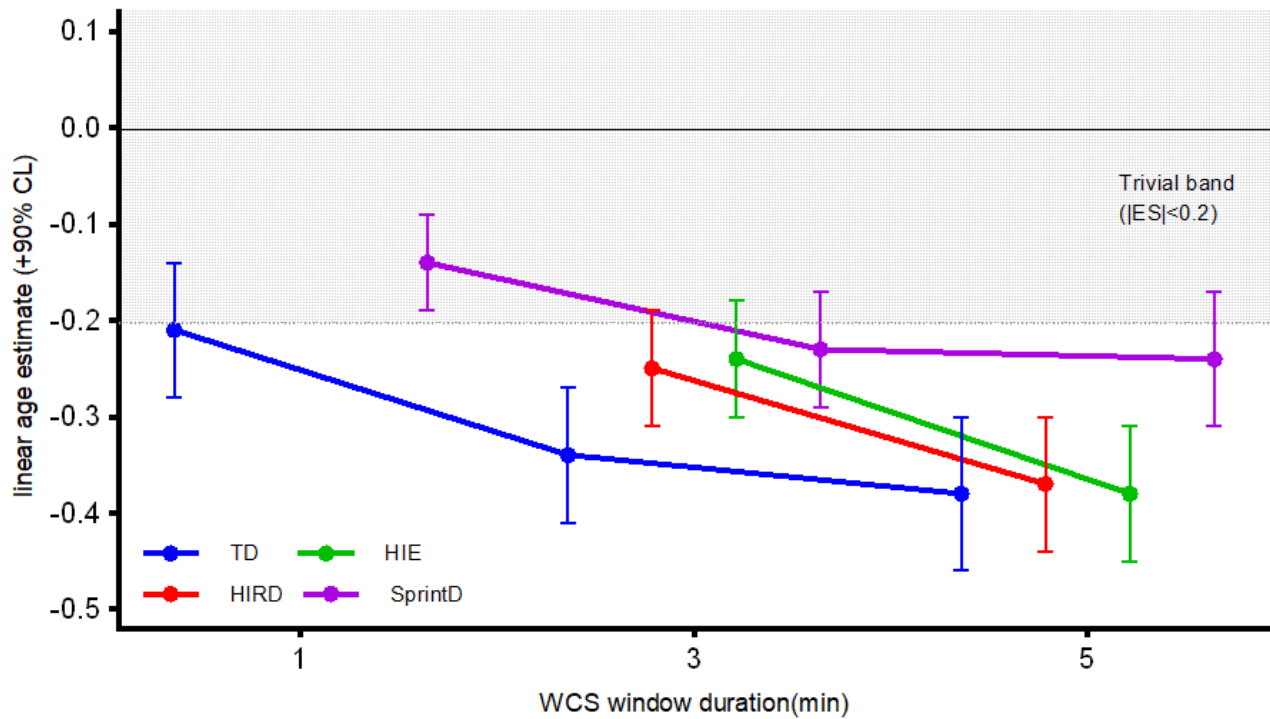


Figure 2

Pooled-sample standardised linear age estimates across WCS window durations. Points show standardised effect sizes (ES), and error bars show 90% confidence-limit half-widths. Filled symbols represent outcomes summarised by fitted linear contrasts. HIRD1min and HIE1min are not plotted because retained quadratic turning-point ages, rather than linear contrasts, are reported for these outcomes in Table 11. The shaded band denotes trivial effect magnitudes ($|ES| < 0.2$). Lines connecting estimates are visual guides only and do not represent or test an age $\times$ window-duration interaction.