Ramadan Fasting Selectively Reshapes Cognition: A Webcam Eye-Tracking Study in the Wild

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Ramadan fasting is observed by 1.8 billion people annually, yet HCI has not characterised how fasting reshapes cognition or what this means for interface design. We deployed a browser-based webcam cognitive assessment platform across 60 sessions from 18 participants during Ramadan 2026, capturing six oculomotor features and computing a four-dimensional Cognitive Readiness Index (CRI). Fasting is not associated with uniform suppression of cognition but with *selective reshaping*: Pattern Recognition significantly exceeded Visual Processing in 82.4% of high-reliability sessions ($M = 47.3$ vs $M = 31.9$; Wilcoxon $W = 55$, $p < 0.001$, $n = 34$). This divergence narrows beyond ten fasting hours ($\rho = -0.452$, $p = 0.007$), suggesting a practical design boundary for fasting-aware systems. A literature-anchored heuristic comparison against established oculomotor norms provides partial support for interpreting observed score levels relative to a non-fasting reference. Webcam capture quality must be explicitly stratified before inference ($p < 0.001$, $r = -0.524$). These preliminary findings have direct implications for the design of adaptive digital interfaces serving the 1.8 billion people who fast annually.

Ramadan fasting; Webcam eye-tracking; Cognitive load; Selective cognitive preservation; Physiological state-aware interfaces; In-the-wild assessment; Digital Bridges; Adaptive HCI

1. INTRODUCTION

Ramadan fasting is observed by the vast majority of the world's 1.8 billion Muslims (Alkurd et al. 2024), representing one of the largest synchronised behavioural events on the global calendar. For a continuous 30-day period each year, a substantial portion of the global workforce, student population, and clinical staffing pool abstains from food and water for 12 to 18 hours daily (Bougrine et al. 2024). This creates a recurring, predictable physiological state that imposes a digital bridge challenge: the same systems must serve users whose cognitive capacity is systematically altered by a culturally defined practice, yet current interface design does not account for this. Cognitive Load Theory establishes that when available cognitive resources are reduced, the same interaction that was manageable at baseline becomes effortful and error-prone (Sweller 1988, 1994), and cognitive workload measurement has become a central concern in HCI (Kosch et al. 2023). Yet HCI has not treated fasting as a physiological state variable. Existing research on Ramadan and cognition has examined performance as a uniform quantity, without asking whether fasting might selectively preserve some capacities while degrading others (Alkurd et al. 2024; Bougrine et al. 2024).

Eye tracking has emerged as a valid method for inferring cognitive state in HCI settings, with oculomotor signals including fixation duration, blink rate, gaze entropy, and pupil diameter serving as established indicators of cognitive load and attentional engagement (Ortega et al. 2022; Aljehane et al. 2023). Prior work at BCS HCI has examined eye movement patterns in cross-platform usability (Majrashi et al. 2016), deceptive interface patterns (Jamalifard et al. 2024), digital health application quality (Hyzy et al. 2022; Khattak et al. 2024), and human-AI interaction in healthcare (Sqalli et al. 2021). Browser-based webcam eye tracking, pioneered by Papoutsaki et al. (2016), extended this to large-scale naturalistic settings. Subsequent validation studies have characterised the accuracy and limitations of

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these approaches relative to laboratory-grade trackers (Slim et al. 2024; Wisiecka et al. 2022; Kaduk et al. 2024), and recent methodological work has advocated for standardised data quality reporting (Jakobi et al. 2024). A key constraint of webcam-based systems is their lower sampling rate, which affects saccade detection and temporal resolution (Leube et al. 2017; Angele et al. 2025). Despite this literature, webcam eye tracking has not been deployed in the specific context of fasting-induced physiological state change.

All findings reported here are correlational. We present oculomotor evidence consistent with selective cognitive reshaping under Ramadan fasting, not a causal demonstration of fasting-induced change. This paper reports a field deployment of a browser-based cognitive assessment platform requiring only a consumer-grade webcam, across 60 sessions from 18 participants during Ramadan 2026. The platform produces a CRI from six oculomotor features across four sub-dimensions: Visual Processing, Pattern Recognition, Response Speed, and Attention Stability. This study makes three contributions:

1. A first characterisation of oculomotor evidence consistent with selective cognitive reshaping under Ramadan fasting, with Pattern Recognition preserved relative to Visual Processing, and direct implications for adaptive interface design.
2. Preliminary evidence of a ten-hour fasting threshold beyond which all cognitive capacities decline together, providing a candidate design boundary for fasting-aware systems pending replication.
3. A data quality stratification methodology showing that webcam capture failures deflate CRI scores systematically, with implications for any naturalistic HCI study using webcam-based eye tracking.

2. METHODS

2.1. Platform

We used a self-developed browser-based eye-tracking platform for cognitive readiness assessment, requiring only a consumer-grade webcam and a standard web browser. The platform was developed on the basis of Nielsen's usability heuristics (Nielsen 1994) and the Guidelines for Human-AI Interaction (Amershi et al. 2019). Assessment comprises a two-phase calibration procedure followed by a structured cognitive evaluation. During each session, the platform captures six oculomotor features in real time: Fixation Duration, Fixation Stability, Gaze Entropy, Saccade Velocity, Pupil Diameter, and Blink Rate. These are integrated into a composite CRI scored 0–100, decomposed into four sub-dimensions as described in Table 1.

The CRI is normalised against established oculomotor norms from the literature (fixation duration 200–350 ms, blink rate 15–20/min, saccade velocity 300–500 °/s (Ortega et al. 2022; Slim et al. 2024)). Although no non-fasting baseline was collected from this cohort, the CRI scoring framework is anchored to these published normative values, providing a partial literature-derived reference for interpreting observed score levels. A session reliability flag distinguishes high-reliability sessions (all core metrics captured) from low-reliability sessions (one or more metrics absent due to webcam limitations). Following each assessment, participants received personalised recovery recommendations calibrated to their current oculomotor state.

2.2. Participants

Eighteen adults who self-identified as observing Ramadan fasting participated voluntarily, recruited through word of mouth and mailing lists. Sessions were completed remotely across multiple countries and time zones. The sample comprised participants primarily aged 18–34 (16 of 18), with two aged 35–45. Gender distribution was 7 female, 9 male, and 2 who preferred not to disclose. Informed digital consent was obtained from all participants. The study protocol received a favourable ethical opinion from the authors' institutional biomedical research ethics committee (dossier B-021/26).

2.3. Study Context

The study was conducted during Ramadan 2026 (18 February – 19 March 2026). Observant Muslims abstain from food and drink from dawn (*Fajr*, approx. 05:30 local time) until sunset (*Maghrib*, approx. 18:10 local time). These anchors defined four fasting periods: Pre-Fajr, Post-Suhoor, Fasting (active window), and Post-Iftar.

2.4. Data Collection and Reliability Classification

The original protocol intended three daily sessions per participant (Post-Suhoor, peak fasting, Post-Iftar). In practice, session frequency ranged from 1 to 13, reflecting a real-world constraint of naturalistic deployment. Prior to each session, participants completed a brief contextual questionnaire capturing sleep duration, Suhoor timing, device type, and prior webcam calibration experience. Raw oculomotor features were inspected; zero values were identified as webcam capture failures and replaced with NaN. Sessions were classified as high-reliability if gaze

Table 1: *CRI sub-dimension feature mapping. Composite aggregation weights are proprietary; the directional findings reported here are robust to reasonable alternative weightings, as the PR–VP divergence reflects a within-session paired comparison rather than absolute score magnitudes. Normative ranges drawn from established literature (Ortega et al. 2022; Slim et al. 2024).*

Sub-dimension	Oculomotor Features	Normative Reference Range
Visual Processing (VP)	Pupil diameter, Saccade velocity	3–5 mm; 300–500 °/s
Pattern Recognition (PR)	Gaze entropy, Blink rate	2.5–4.0 bits; 15–20 blinks/min
Response Speed (RS)	Saccade velocity, Fixation duration	300–500 °/s; 200–350 ms
Attention Stability (AS)	Fixation stability (BCEA), Fixation duration	BCEA $<$ 2.0 deg^2; 200–350 ms

count, blink count, and pupil diameter were all successfully captured, and low-reliability otherwise. This yielded 34 high-reliability and 26 low-reliability sessions from 60 retained in the final dataset.

2.5. Statistical Analysis

All cognitive score distributions departed significantly from normality (Shapiro-Wilk, all $p < 0.05$), justifying non-parametric tests throughout. Group comparisons used Kruskal-Wallis (three or more groups) and Mann-Whitney U (pairwise), with rank-biserial r as effect size; Bonferroni correction was applied where multiple comparisons were performed. The primary finding was tested using the Wilcoxon signed-rank test. Associations between continuous variables used Spearman rank correlation. A fixed-effects regression controlled for between-person differences in the within-person fasting analysis. All analyses were conducted in Python (scipy.stats, statsmodels, pandas; $\alpha = 0.05$). Every analysis was first conducted on the full dataset ($n = 60$) then replicated on the high-reliability subset ($n = 34$); findings holding in both layers are reported as *robust*.

2.6. AI Assistance Declaration

In accordance with BritCHI 2026 submission guidelines, the authors declare the following use of AI assistance. The Claude AI assistant and Claude Code (Anthropic) were used to support exploratory statistical analysis, generate and debug Python analysis notebooks, produce data visualisations, and assist in drafting and editing the manuscript. All analytical decisions, interpretations, and conclusions were made and verified by the authors, who take full responsibility for the accuracy and integrity of the reported findings.

3. RESULTS

Global cognitive scores ranged from 10 to 64 ($M = 37.8$, $SD = 13.9$, Mdn $= 42.0$).

3.1. Session Reliability and Data Quality

Of 60 retained sessions, 34 (56.7%) were high-reliability and 26 (43.3%) low-reliability. The most prevalent failure was blink detection (33.3%), followed by pupil diameter (28.3%) and gaze count (20.0%). High-reliability sessions produced substantially higher global scores (Mdn $= 43.5$, IQR $= 42.2$–49.8) compared to low-reliability sessions (Mdn $= 27.0$, IQR $= 20.8$–39.8; Mann-Whitney $U = 674$, $p = 0.001$, $r = -0.524$). The 16.5-point median difference exceeds many of the fasting-period comparisons reported below, underscoring that capture quality is the single strongest moderator of observed scores in webcam-based assessment. Without explicit stratification, cross-condition comparisons risk confounding genuine cognitive differences with systematic measurement failures.

The high-reliability global mean of 43.6/100 falls well below the platform's optimal readiness threshold of 75, which is calibrated against the literature-derived normative ranges described in Section 2.1. This is consistent with the physiological demands of Ramadan fasting and provides a partial heuristic anchor for interpreting absolute score levels in the absence of a within-cohort non-fasting baseline.

3.2. Cognitive Sub-Score Profiles

Table 2 reports descriptive statistics for all five cognitive score variables. In the high-reliability subset ($n = 34$), Pattern Recognition returned the highest mean ($M = 47.3$, $SD = 16.9$), exceeding Visual Processing ($M = 31.9$, $SD = 19.2$) by 15.4 points. This asymmetry was consistent across both the full dataset and the high-reliability subset. Attention Stability showed a bimodal distribution in the full dataset, with 58.3% of sessions scoring zero due to capture failures; this reduced to 26.5% in the high-reliability subset.

Table 2: *Cognitive sub-scores: mean ± SD (median). HR = high-reliability ($n = 34$); Full = full dataset ($n = 60$).*

Score	Full (n=60)	HR (n=34)	HR vs. literature norm
Visual Processing	21.2 ± 20.1 (21.5)	31.9 ± 19.2 (33.0)	Below norm (pupil/saccade degraded)
Response Speed	21.8 ± 20.0 (20.0)	33.0 ± 18.2 (34.5)	Below norm (fixation latency elevated)
Attention Stability	19.9 ± 25.1 (0.0)†	35.2 ± 24.0 (40.0)	Partial (high capture failure rate)
Pattern Recognition	34.4 ± 22.4 (36.0)	47.3 ± 16.9 (47.0)	Closest to norm (gaze/blink preserved)
Global Score	37.8 ± 13.9 (42.0)	43.6 ± 11.1 (43.5)	Below optimal threshold (75/100)

†58.3% of full-dataset sessions scored zero; reduced to 26.5% in HR subset (median = 40.0).

3.3. Selective Preservation: The PR–VP Divergence

The central finding is a robust and systematic oculomotor divergence between Pattern Recognition (PR) and Visual Processing (VP) scores *within the same sessions*, correlational in nature and consistent with selective cognitive reshaping under fasting. This within-session paired comparison partially controls for stable individual differences: any consistent between-person bias in absolute score levels would affect both PR and VP equally, leaving the divergence unaffected. In the high-reliability subset, PR ($M = 47.3$) exceeded VP ($M = 31.9$) by 15.4 points (Wilcoxon $W = 55$, $p < 0.001$), with positive divergence present in 82.4% of high-reliability sessions. The finding was consistent across the full dataset ($W = 73$, $p < 0.001$, 68.3% of sessions), ruling out measurement artefacts in low-quality sessions as a driver.

This dissociation is consistent with the cell-preservation mode described by Mattson et al. (2018), in which fasting neurons conserve energy by down-regulating metabolically expensive early-stage processes while maintaining goal-directed attentional function, and with neuroimaging evidence that frontoparietal networks carry substantially higher relative energetic costs than visual networks (Shokri-Kojori et al. 2019). Critically, the PR–VP divergence does not require an absolute non-fasting baseline to be interpretable: it is a within-session, within-participant contrast that holds regardless of between-person baseline differences.

3.4. Fasting Exposure and the Divergence Gradient

Figure 1 shows PR and VP scores across the fasting day. Both sub-scores follow a characteristic arc, rising from pre-dawn values, peaking at 8–10 fasting hours, then declining before a partial Post-Iftar recovery (Bougrine et al. 2024; Khemila et al. 2023). Critically, PR remains consistently above VP throughout the entire arc, confirming that selective preservation is persistent rather than confined to a single window.

Figure 2 shows the divergence score (PR minus VP) as a function of fasting hours. The divergence peaks at 3–5 fasting hours (binned mean = 39.2 points, high-reliability), then narrows progressively, approaching zero beyond 10 hours. Spearman correlation confirmed this negative gradient: $\rho = -0.452$ ($p = 0.007$) in the high-reliability subset and $\rho = -0.272$ ($p = 0.035$) in the full dataset. Beyond 10 hours, PR also begins to decline, compressing the divergence from above.

An exploratory analysis found a modest positive association between day of Ramadan and global score ($\rho = +0.299$, $p = 0.020$), consistent with gradual cognitive adaptation across the fasting month. This is directionally consistent with a fasting-specific rather than stable-individual-difference explanation of the observed scores, though the cross-sectional design prevents causal interpretation.

A fixed-effects regression restricted to 8 multi-session participants ($n = 50$ sessions) returned the expected negative direction ($\beta = -0.239$, $p = 0.616$), but was underpowered given the highly unbalanced session distribution. Directional consistency between the cross-sectional gradient ($\rho = -0.452$) and the within-person coefficient ($\beta = -0.239$) provides convergent evidence for a genuine fasting effect.

4. DISCUSSION

This study provides three converging answers to underexplored questions at the intersection of HCI, oculomotor science, and physiological state awareness, while acknowledging the preliminary nature of the findings given the small sample and absent within-cohort baseline.

4.1. Selective cognitive reshaping.

The most actionable design insight is not that fasting degrades cognition, as this is well-established (Mattson et al. 2018; Kapogiannis et al. 2024), but that the oculomotor evidence is consistent with selective degradation. VP is preferentially impaired while PR is relatively preserved, a dissociation grounded in

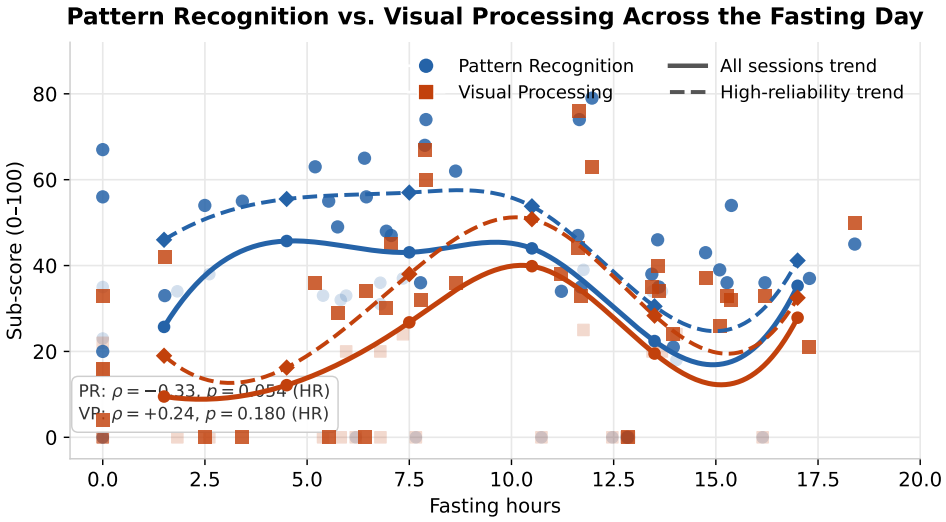

Figure 1: *Pattern Recognition (blue circles) and Visual Processing (red squares) as a function of fasting hours. Solid trend lines = all sessions ($n = 60$); dashed = high-reliability subset ($n = 34$). PR consistently exceeds VP at every fasting stage.*

the cell-preservation mode (Mattson et al. 2018) and the differential energetic cost of visual versus frontoparietal networks (Shokri-Kojori et al. 2019). For HCI practitioners, this means the cognitive cost imposed by fasting is not uniform across tasks. Visual search and high-density interfaces impose disproportionately higher costs on fasting users than goal-directed navigation or categorical judgement. Reducing visual complexity, increasing contrast ratios, and prioritising pattern-based over detail-based interface elements are concrete design responses that a fasting-aware system could activate when fasting context is detected or inferred (Amershi et al. 2019; Sweller 1988). More specifically, three practitioner-facing directions follow from these preliminary findings: calendar-aware systems could shift task presentation during Ramadan toward categorical and pattern-based interactions; progressive disclosure strategies could defer dense information layouts to post-Iftar windows when cognitive resources are restored; and fasting-aware notification scheduling could hold cognitively demanding visual tasks such as dense dashboards or complex data visualisations until after the fast is broken. These implications should be treated as design *hypotheses* motivated by this pilot study, pending empirical evaluation in formal adaptive interface studies.

4.2. A candidate ten-hour threshold.

Beyond approximately ten fasting hours, selective preservation collapses and all cognitive dimensions decline together, consistent with evidence that prolonged caloric restriction impairs multiple cognitive domains simultaneously (Kapogiannis et al. 2024). Systems that can infer fasting duration — through user-declared start times, prayer schedule integration, or physiological sensing — could use this threshold to trigger targeted adaptive responses such as simplified task structures or explicit readiness warnings. The threshold is a candidate boundary derived from this pilot dataset and requires replication before it should be operationalised.

4.3. Webcam sensing in the wild.

Consumer-grade webcam eye tracking can detect fine-grained cognitive state differences in naturalistic deployments, but only when signal quality is explicitly stratified. Webcam capture failures produce systematically lower scores rather than randomly noisier ones ($r = -0.524$), consistent with findings by Slim et al. (2024) and Wisiecka et al. (2022). Without explicit reliability stratification, genuine cognitive differences will be confounded with measurement artefacts — a methodological lesson for any naturalistic HCI study deploying webcam-based sensing.

4.4. Ethical considerations.

Inferring fasting state from oculomotor signals carries risks of religious or workplace profiling. Any deployment of fasting-aware adaptive systems must be implemented with explicit user consent, transparent data handling, and institutional safeguards against discriminatory use. The CRI is a research instrument not validated for clinical or occupational screening and must not be used as such without prospective validation against established neuropsychological benchmarks.

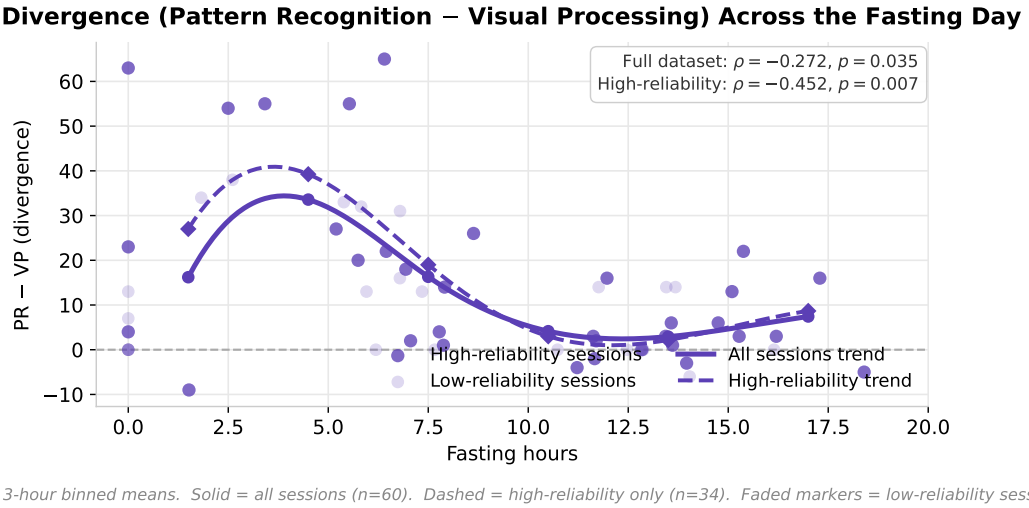

Figure 2: *PR−VP divergence across the fasting day. Divergence peaks at 3–5 hours and narrows toward zero beyond 10 hours ($\rho = -0.452$, $p = 0.007$, HR subset), suggesting a candidate design boundary for fasting-aware adaptive systems.*

4.5. Limitations.

The sample is small ($n = 18$) and geographically concentrated; all findings are pilot observations pending replication in a larger, more diverse cohort. No non-fasting baseline was collected from this cohort, preventing determination of whether the observed cognitive profile reflects fasting specifically or a more general population feature. The PR–VP within-session comparison provides partial internal control, and the literature-anchored CRI normative framework provides a heuristic reference, but neither substitutes for an empirical baseline. A pre-Ramadan baseline collection from the same participants is the primary goal of the planned follow-up study, as recommended by the institutional ethics committee. The CRI composite weights are proprietary and have not been validated against neuropsychological benchmarks; score magnitudes should be interpreted as relative rather than absolute measures.

5. CONCLUSION

Ramadan fasting selectively reshapes cognition: Pattern Recognition is preserved while Visual Processing is significantly degraded, a dissociation consistent with cell-preservation under caloric restriction (Mattson et al. 2018; Kapogiannis et al. 2024). This selective preservation narrows and collapses beyond approximately ten hours, providing a candidate design boundary for adaptive fasting-aware systems. To our knowledge, this is the first webcam-based eye-tracking study to characterise the differential cognitive effects of Ramadan fasting in the wild. Consumer-grade webcam sensing, when paired with rigorous data quality stratification, can detect these fine-grained differences in naturalistic deployments — opening a digital bridge between physiological state and interface adaptation for the 1.8 billion people who fast annually. These findings are preliminary and require replication; future work will establish non-fasting baselines, validate the CRI against neuropsychological standards, and test whether fasting-aware interface adaptations measurably improve task performance for fasting users.

REFERENCES

Sqalli, M.T., Al-Thani, D., Qaraqe, M. and Fernandez-Luque, L. (2021) Perspectives on Human-AI Interaction Applied to Health and Wellness Management: Between Milestones and Hurdles. In: Househ, M., Borycki, E., Kushniruk, A. (eds) *Multiple Perspectives on Artificial Intelligence in Healthcare. Lecture Notes in Bioengineering*. Springer, Cham. doi:10.1007/978-3-030-67303-1_4

Shokri-Kojori, E., Tomasi, D., Alipanahi, B., Wiers, C.E., Wang, G.J. and Volkow, N.D. (2019) Correspondence between cerebral glucose metabolism and BOLD reveals relative power and cost in human brain. *Nature Communications*, 10(1), 690. doi:10.1038/s41467-019-08546-x

Khemila, S., Romdhani, M., Farjallah, M.A., Abid, R., Bentouati, E., Souissi, M.A., Abedelmalek, S., Garbarino, S. and Souissi, N. (2023) Effects of Ramadan fasting on the diurnal variations of physical and cognitive performances at rest and after exercise in professional football players. *Frontiers in Psychology*, 14, 1148845. doi:10.3389/fpsyg.2023.1148845

Alkurd, R., Mahrous, L., Zeb, F., Khan, M.A.B., Alhaj, H., Khraiwesh, H.M. and Faris, M.E. (2024) Effect of Calorie Restriction and Intermittent Fasting Regimens on Brain-Derived Neurotrophic Factor Levels and Cognitive Function in Humans: A Systematic Review. *Medicina*, 60(1), 191. doi:10.3390/medicina60010191

Bougrine, H., Chalghaf, N., Azaiez, C. et al. (2024) The impact of intermittent fasting during Ramadan on psychomotor and cognitive skills in adolescent athletes. *Frontiers in Sports and Active Living*, 6, 1362066. doi:10.3389/fspor.2024.1362066

Aljehane, S.D., Sharif, B. and Maletic, J.I. (2023) Studying developer eye movements to measure cognitive workload and visual effort for expertise assessment. *Proceedings of the ACM on HCI*, 7(ETRA), Article 166. doi:10.1145/3591135

Sweller, J. (1988) Cognitive load during problem solving: Effects on learning. *Cognitive Science*, 12(2), pp. 257–285. doi:10.1016/0364-0213(88)90023-7

Sweller, J. (1994) Cognitive load theory, learning difficulty, and instructional design. *Learning and Instruction*, 4(4), pp. 295–312. doi:10.1016/0959-4752(94)90003-5

Kosch, T., Karolus, J., Zagermann, M. et al. (2023) A survey on measuring cognitive workload in Human-Computer Interaction. *ACM Computing Surveys*, 55(13s), Article 261. doi:10.1145/3582272

Papoutsaki, A., Sangkloy, P., Laskey, J., Daskalova, N., Huang, J. and Hays, J. (2016) WebGazer: Scalable webcam eye tracking using user interactions. In *Proc. IJCAI-16*, pp. 3839–3845. AAAI Press. doi:10.5555/3061053.3061156

Wisiecka, K., Krejtz, K., Krejtz, I. et al. (2022) Comparison of webcam and remote eye tracking. In *Proc. ETRA '22*, pp. 1–7. ACM. doi:10.1145/3517031.3529615

Kaduk, M., Goeke, C., Finger, H. and König, P. (2024) Webcam eye tracking close to laboratory standards: Comparing a new webcam-based system and the EyeLink 1000. *Behavior Research Methods*, 56, pp. 4007–4024. doi:10.3758/s13428-023-02237-8

Amershi, S., Weld, D., Vorvoreanu, M. et al. (2019) Guidelines for human-AI interaction. In *Proc. CHI 2019*, pp. 1–13. ACM. doi:10.1145/3290605.3300233

Nielsen, J. (1994) Enhancing the explanatory power of usability heuristics. In *Proc. CHI'94*, pp. 152–158. ACM. doi:10.1145/191666.191729

Kapogiannis, D., Manolopoulos, A., Mullins, R. et al. (2024) Brain responses to intermittent fasting and the healthy living diet in older adults. *Cell Metabolism*, 36(8), pp. 1668–1678. doi:10.1016/j.cmet.2024.05.017

Mattson, M.P., Moehl, K., Ghena, N., Schmaedick, M. and Cheng, A. (2018) Intermittent metabolic switching, neuroplasticity and brain health. *Nature Reviews Neuroscience*, 19(2), pp. 63–80. doi:10.1038/nrn.2017.156

Majrashi, K., Hamilton, M. and Uitdenbogerd, A.L. (2016) Correlating cross-platform usability problems with eye tracking patterns. In *Proc. BCS HCI 2016*. BCS Learning & Development Ltd. doi:10.14236/ewic/HCI2016.40

Hyzy, M., Bond, R., Mulvenna, M., Bai, L. and Leigh, S. (2022) Quality assessment and user experience analysis of digital health apps. In *Proc. BCS HCI 2022*. BCS Learning & Development Ltd. doi:10.14236/ewic/HCI2022.56

Khattak, K.A., Woolley, S.I. and Collins, T. (2024) Wearables, healthcare-computer interaction and the internet of obscure medical things. In *Proc. BCS HCI 2024*, pp. 225–229. BCS Learning & Development Ltd. doi:10.14236/ewic/BCSHCI2024.22

Jamalifard, M., Russell-Rose, T. and Brignull, H. (2024) Exploring deceptive patterns: Insights from eye tracking, EMG and sentiment analysis. In *Proc. BCS HCI 2024*. BCS Learning & Development Ltd. doi:10.14236/ewic/BCSHCI2024.20

Slim, M.S., Kandel, M., Yacovone, A. and Snedeker, J. (2024) Webcams as windows to the mind? A direct comparison between in-lab and web-based eye-tracking methods. *Open Mind*, 8, 1369–1424. doi:10.1162/opmi_a_00171

Jakobi, D.N., Krakowczyk, D.G. and Jäger, L.A. (2024) Reporting eye-tracking data quality: Towards a new standard. In *Proc. ETRA '24*. ACM. doi:10.1145/3649902.3655658

Leube, A., Rifai, K. and Wahl, S. (2017) Sampling rate influences saccade detection in mobile eye tracking of a reading task. *Journal of Eye Movement Research*, 10(3). doi:10.16910/jemr.10.3.3

Angele, B., Günes Ozkan, Z., Serrano-Carot, M. and Duñabeitia, J.A. (2025) How low can you go? Tracking eye movements during reading at different sampling rates. *Behavior Research Methods*, 57(7), 195. doi:10.3758/s13428-025-02713-3

Ortega, J., Plaska, C.R., Gomes, B.A. and Ellmore, T.M. (2022) Spontaneous eye blink rate during

the working memory delay period predicts task accuracy. *Frontiers in Psychology*, 13, 788231. doi:10.3389/fpsyg.2022.788231