

Research Report 2025



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Looking back at 2025 ...

iMotions is a trailblazing research software that has enriched the academic world with thousands of publications over the last two decades. We're excited to share with you an inspiring overview of the groundbreaking research accomplished with the help of iMotions in 2025.

This past year, our clients have published an impressive array of articles, book chapters, conference papers, and posters. These contributions span a diverse range of fields, including clinical and educational research, user experience, human factors, communication psychology, traffic psychology, sensory research, and across many more fields.

Trends in 2025

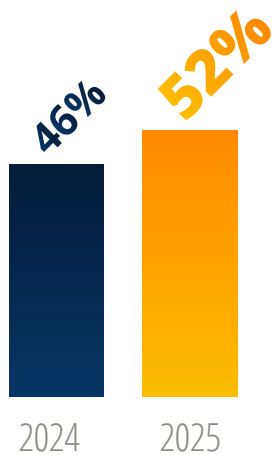
Multimodal Research On The Rise

A notable trend in 2025 was the integration of modalities. **52%** of the articles published leveraged more than one biosensor to gain deeper insights. Compared to the previous year, 6% more publications highlighted the value of combining biosensors to understand the multifaceted nature of their research questions.

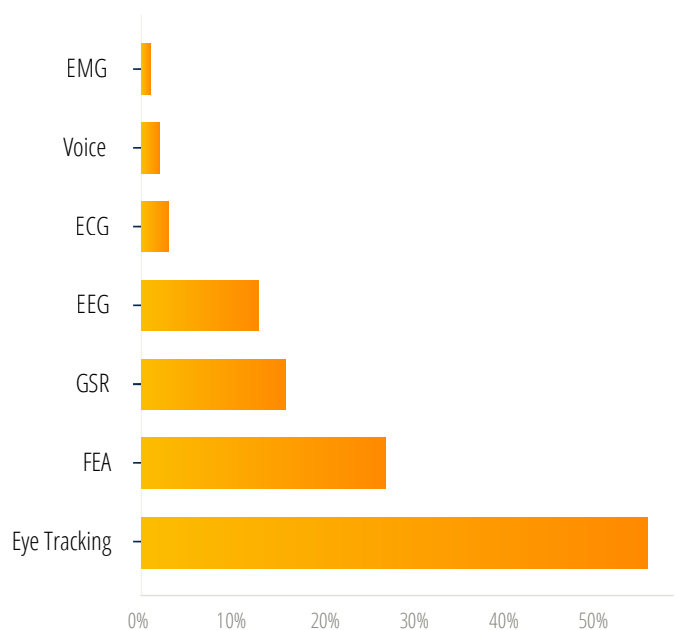
64% publications used **eye tracking**, making it 2025's most popular modality.

Eye tracking was often paired with other modalities, such as **facial expression analysis, galvanic skin response (GSR) or electroencephalography (EEG)**, enriching findings with valence, arousal, motivation, and cognitive data.

Multimodal research on the rise ...



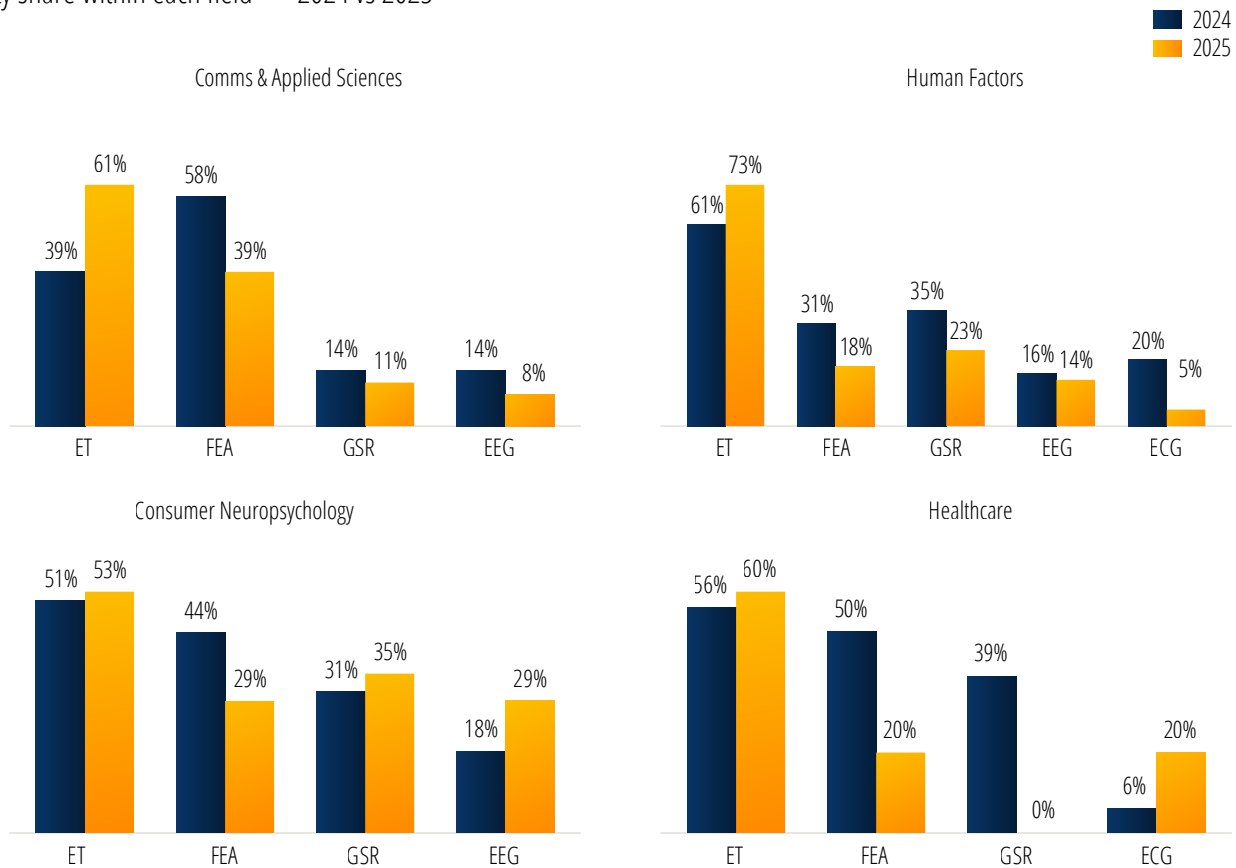
Modality usage — % of publications



The biometrics research field also saw an increase in publications using voice analysis as a measure of emotional expression. In line with newer trends, voice analysis was also used with chatbots, as highlighted in the Human Factors section below.

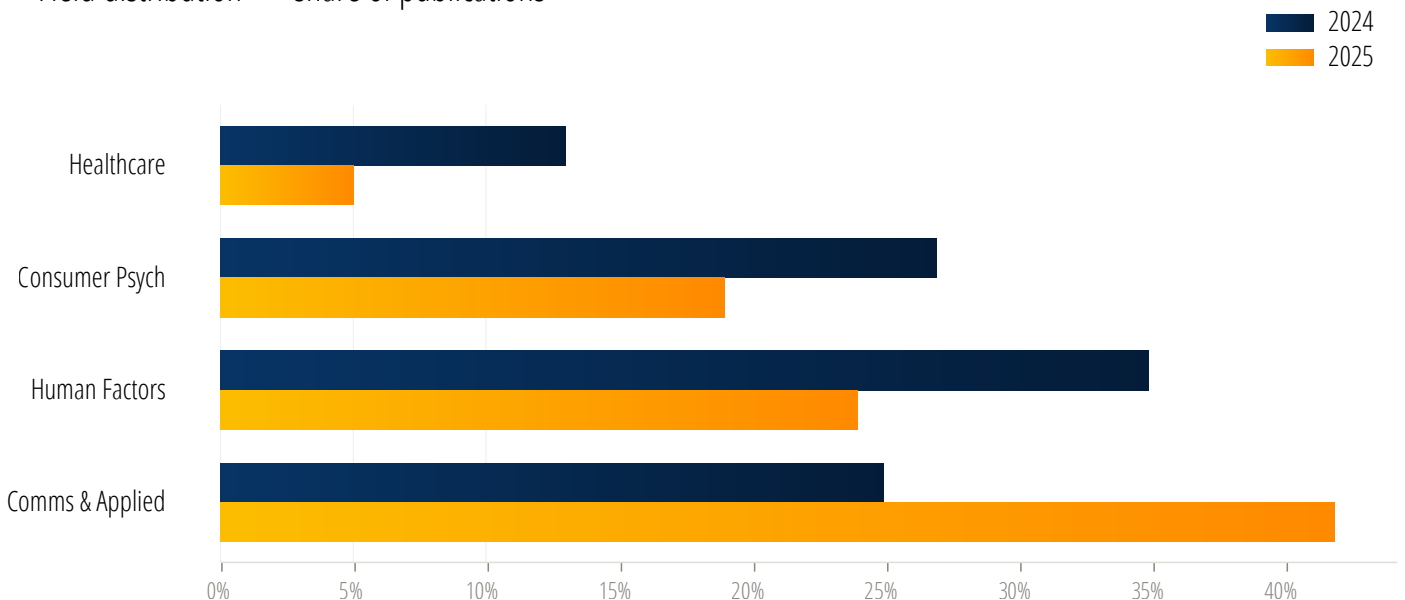
Eye tracking leads the way

Modality share within each field — 2024 vs 2025

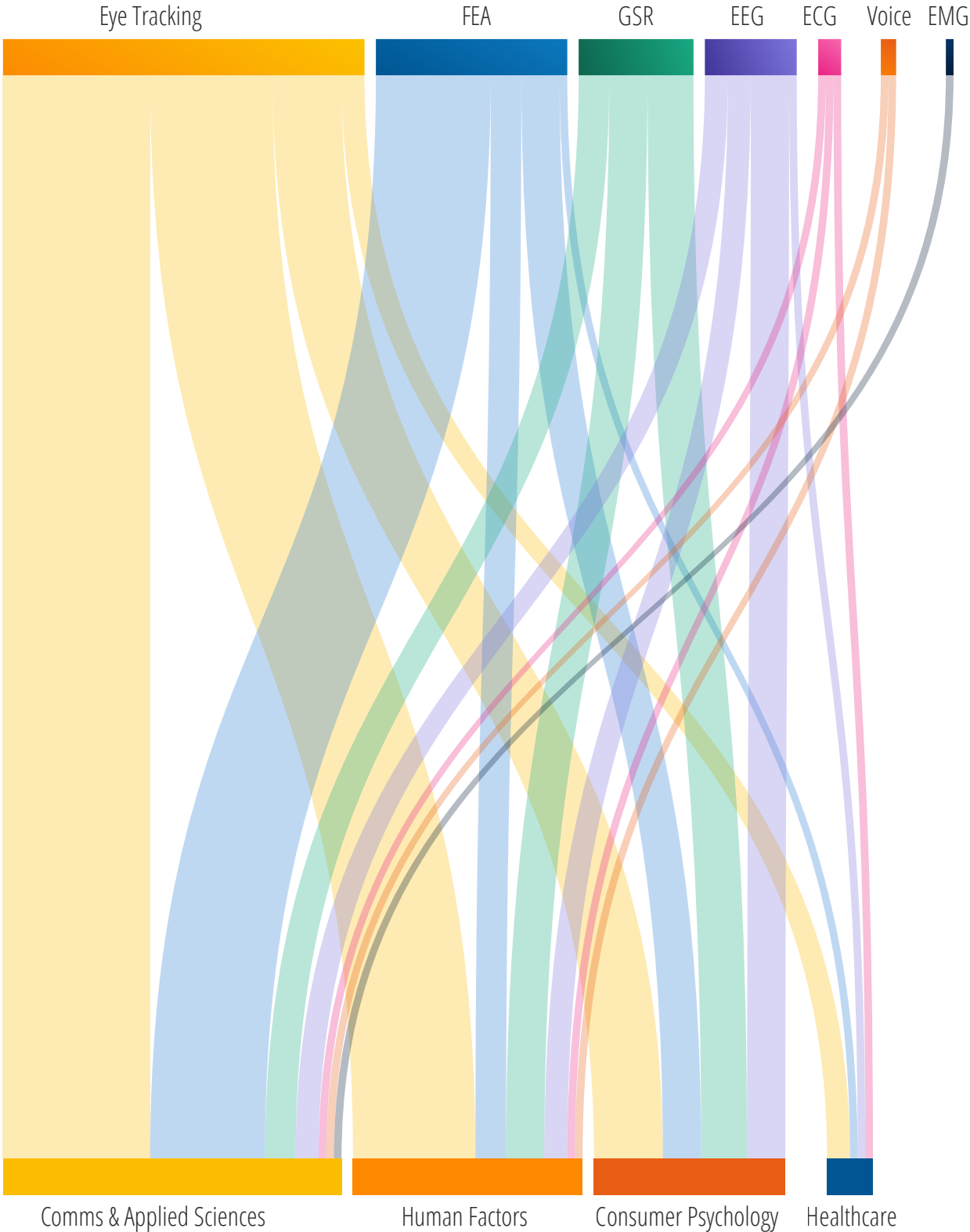


A shift toward communications and applied sciences

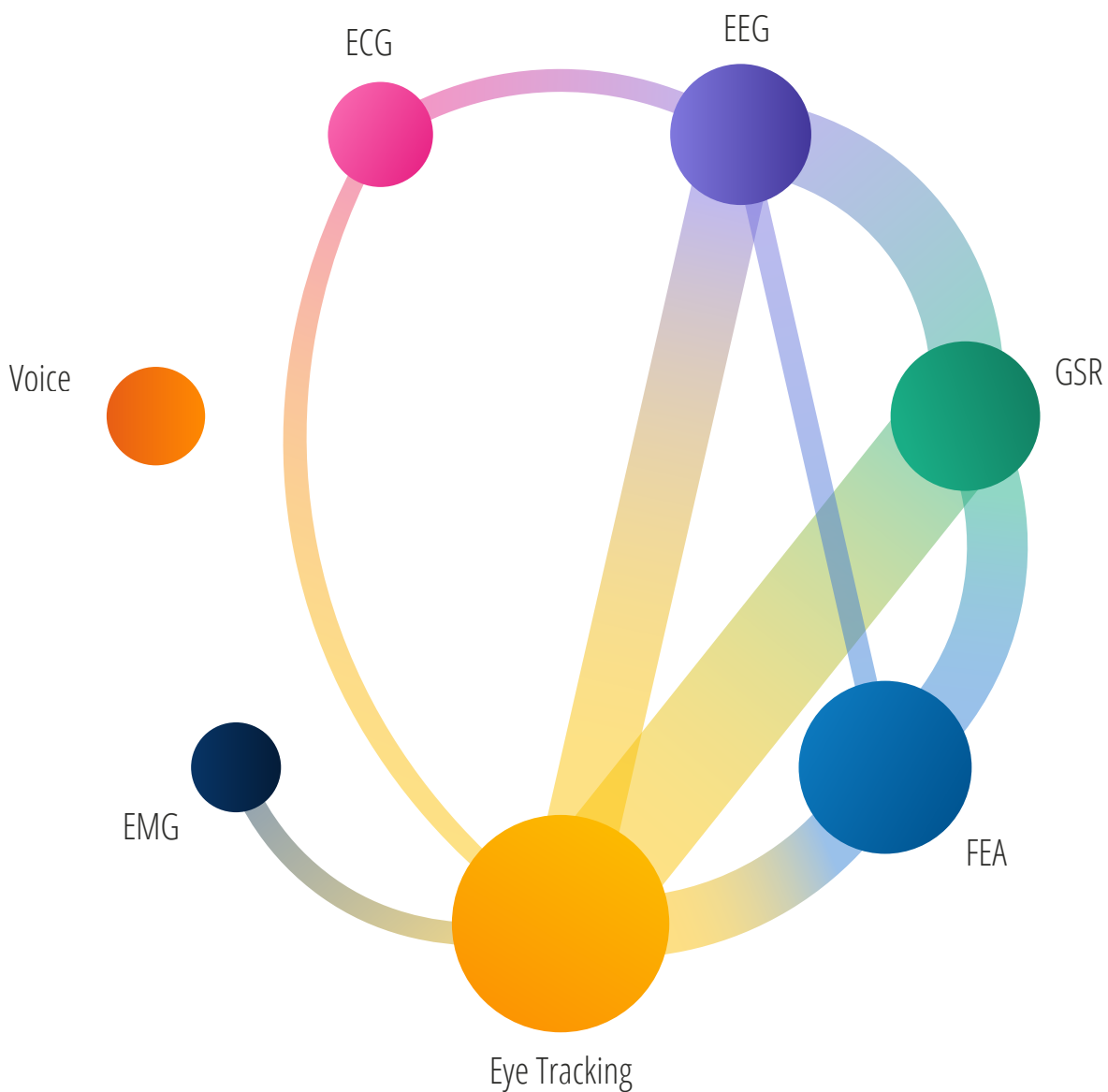
Field distribution — share of publications



How modalities spread across fields



Modalities in combination



Investigating and Leveraging AI

Continuing with the trend that already started in 2024, use of machine learning or AI models for behavioral research gained significant momentum in 2025. Out of the four sections presented below, **20% of articles in the human factors field, and 11-12% each in communications and applied sciences as well as healthcare, used AI models to derive further insights from their biosensor data.**

Related to the increase in AI, research this year also focused on how we perceive content created by AI, asking participants to rate or view AI-generated versus human-generated content and measuring their attention and emotional responses.



Human Factors

Human factors and usability research provides new insights into how people perform under various conditions, and how the environment around them can be improved based on this understanding of human behavior. These environments could be industrial workplaces, vehicles, iconic buildings, or everyday landscapes.

One branch of this field focuses on making environments better for the people using or inhabiting it. Some examples of research published this year were car-centric vs. human-centric design in cities, measuring cognitive load on varying language complexities in UX design, effectiveness of learning based games, measuring performance on cognitive tasks if the office has nature or urban elements, understanding attention patterns in surveys using different design principles, and physiological effects of guided meditation.

Another branch focuses on taking care of how people work in an environment.

Publications in this branch included evaluating workers in safety scenarios by playing 3D games of the environment, measuring driver responses to alert systems, measuring experts and novices in the GUI of different aircraft systems, measuring attention to ads on websites or emotion detection during planning tasks in a calendar app.

Highlights

- 20% of articles used machine learning and AI tools to derive further insights from the biometric data.
- Publications with a wide variety of physiological measures and a combination of biosensors such as GSR, ECG, EMG, and fNIRs.
- A broad range of topics covered how humans react to different environments and how different environments influence human well-being and performance. Research shows how the environment and the people in them can be aided to improve performance, increase feelings of well-being, and decrease stress and cognitive workload.

Research Stories

Learn from your peers.

Clarity from complexity: thorough multimodal method evaluation pays off.

Shehab et al., designed standardized experimental procedures for assessing cognitive task performance and stress levels in construction professionals. They created a comprehensive battery of tasks, including building Lego blocks, recalling project details from memory, performing document searches, observing an excavation process, and estimating costs, modulating task complexity. To measure stress and performance holistically, they used EEG, eye-tracking, GSR, HRV, and self-report on the NASA-TLX. **Stress and performance showed an inverted U with respect to task complexity: performance peaked with moderate task complexity, while low and high complexity levels resulted in lower performance and higher stress.**

This is a very good example of how to establish a methodology, even if it means elaborate study design and multiple pilot studies to determine which sensor(s) and test outcomes should be explored further and which metrics balance assessment accuracy and real-world pragmatics.

Satisfaction with Voice Assistance is expressed differently depending on the device and the task.

Ravi et al., used Voice analysis to evaluate two different device types: voice-only voice assistants (VOVA) and multimodal voice assistants (MMVA). In a large research project, including three studies with about 100 people in each study, participants interacted with different devices in tasks that varied in pleasantness and complexity.

They also investigated the influence of device anthropomorphism, how human-like the device was. They found that different device types are better suited for different contexts, and the users' voice tone and speech content can explain these differences. **The main findings showed that for task-related aspects (pleasantness and complexity), participants' emotions are conveyed by voice alone. For device-related aspects, consumers articulate their emotions through word choice. However, this changes when devices differ in anthropomorphism. As the device demonstrates more human attributes, people alter their tone and words to match the human-like features of the device.**



Communication & Applied Sciences

The field of communication and applied sciences focuses on everything from interpersonal dynamics to nudging people toward prosocial behaviour. This year, research in the field has ranged from architecture (e.g., evaluating building facades and street design), to perceived messaging in scenarios where effective communication could make teams and processes better. These include perception of messages around carbon footprints, breast cancer screening, and donation behaviour.

Interpersonal communication research has focused on improving efficiency across teams and relationships. Highlights in communication research include exploring communication between leaders and participants for emotional synchrony, in high stress environments, or in trust building games to make reciprocal investment decisions. There has been a surge in research related to communication during teaching, whether it be classroom teaching, online teaching, or games to teach rural children. A combination of biosensors makes it possible to have teaching evaluation in a lab or in ecologically valid setups, be it online or in classrooms.

Highlights

- A trend towards nudging people to engage in better, prosocial or environmentally conscious behaviour.
- A surge of studies with real-world applications such as architecture and teaching.
- Visual attention is still a primary focus, although emotional measurements through facial expressions, GSR and HRV are often combined with this.

Research Stories

Learn from your peers.

Leveraging Tourist's gaze to evaluate external crowd density and internal emotions

Mashkov et al., used eye-tracking glasses and GSR with participants walking through urban areas with various crowd densities. In their creative research design, participants stopped at 5 key locations, including a location for a baseline measure, and one that would be considered relaxing. **Results show that areas with higher crowd density affect participants' emotional states and attention patterns. The study went a step further to demonstrate that the participant's gaze can be used as a measure of crowd density and congestion as well as emotional arousal.**

Multimodal Open Dataset for Spatial Thinking: A free resource of explicit and implicit metrics.

Ashwin et al, compiled a thorough dataset for researchers to study spatial thinking. They measured 38 participants on mental rotation tasks using eye-tracking, GSR, EEG, FEA, and task performance parameters like reaction time and accuracy. The dataset includes both raw and processed data. Further, the dataset includes answers to demographic questions and questionnaires on spatial anxiety, personality traits, self-regulation, and NASA-TLX. Two working memory tasks were also conducted as part of the pre-survey. **The research team found differences in all the biosensor metrics analysed. However, the bigger contribution is a step in the direction of open science where all data and code has been made available for future researchers to leverage and grow the field of research.**



Healthcare

Much of healthcare research with biosensors is devoted to unraveling the emotional and cognitive responses of clinical populations. This goes beyond improving diagnosis and rehabilitation. A large part of the healthcare research is dedicated to finding biomarkers (such as those for neurodevelopmental disorders) or evaluating new interventions, tools, and their outcomes. Modalities such as facial expression and voice analysis are gaining traction in evaluating client-patient relationships. The field of healthcare has also been overlapping with communication psychology to give feedback to caregivers and emergency teams, or to improve communication within medical teams.

Highlights

- Evaluating communication within teams and with patients is gaining traction in the field
- Increased use of facial expressions and voice analysis in evaluating therapy outcomes
- Biomarker research is still the strongest field of research for the use of biosensors.

Research Stories

Learn from your peers.

Eye tracking impairments in patients with Migraines with Aura

Jovanović et al. explore interictal characteristics of eye movements in individuals with Migraine with aura (MwA) during reading. They manipulated various parameters to influence the cognitive and perceptual load during reading tasks and found observable impairments in eye-tracking parameters in the patients versus the control group. **The MwA patients showed consistently poor performance on eye-tracking parameters when colour and contrast made reading more difficult. The study shows evidence for potential eye-tracking biomarkers for visual processing deficits in the interictal phase of MWA.**

Compassion meditation changes heart rate variability in healthcare workers

Andreu et al., evaluated a guided meditation practice and its impact on well-being. They used EEG and ECG to compare participants in the baseline eyes-closed condition with an audio-stimulus story-based guided-meditation task. **They found the meditation condition to show increased heart rate variability in participants, coinciding with increased self-report values on compassion measures. Multimodal studies like these are important to evaluate which modalities and biomarkers show promise.** In the present study, ECG was more sensitive than EEG. Studies like these are instrumental in building evidence for and against interventions in healthcare.



Consumer Neuropsychology

Consumer neuropsychology is emerging as a field of research focused on **evaluating attention, preferences, and perceptions of AI-generated content**, including social media platforms. This reflects the global trend of an increase in AI tools and integrations, with researchers in the field trying to decode how consumers perceive the increase in AI-generated content.

Consumer Neuropsychology is also **exploring how consumers receive sponsored versus organic content, hinting at changes in marketing trends globally and how the consumption of social media has changed over the years**. This year's research has focused on information processing and decision-making in impulse-buying behaviour, decisions with or without certain information (e.g., calorie counts), choices made with or without brand familiarity, and decision errors in evaluating phishing emails. Research in this field guides companies in tailoring their marketing strategies to align with the beliefs of their targeted consumers. It's a compelling blend of science and marketing, revealing the nuanced relationship between consumer behavior and the drive for better-tailored products and marketing.

Highlights

- Emerging research trends to evaluate AI-generated content.
- Trends to study sponsored versus organic marketing
- Eye-tracking still leads the field in exploring attention metrics and is almost always paired with a biosensor that provides insights into consumers' emotional or motivational states.

Research Stories

Learn from your peers.

Safety Communication: Fasten your seatbelt to start your adventure

Liu and Zhao evaluated how promoting destinations in in-flight safety videos is received by consumers. They used GSR and eye-tracking to examine the emotional and attentional responses to these adapted in-flight videos. **They found that in-flight videos with destination promotion evoked higher arousal and more focused attention.** Connecting it to pre-existing literature, the authors could generalise these findings as suggestions to increase curiosity and emotional arousal with culturally embedded content.

Cashew Comparison: Sensory Research Methodology

Navarro et al., compared two cashew brands in an overarching study evaluating the brands on appearance, aroma, and taste. This study meets a high methodological standard for sensory study. They included a large sample size of 80 participants. They used EEG and GSR as implicit biometric measures and combined these with explicit evaluations such as hedonic scales, JAR scales, and sensory evaluation questionnaires. **The convergence of all these measurements gives robust results showing brand preference based on every aspect of the sensory evaluation.** The study provides a good standard for sensory studies including how to use this for novel food development for future projects in the industry.

Conclusions

- 52% of all articles published are multimodal
- Machine learning and AI to leverage metrics from biosensors is gaining traction, particularly in human factors but healthcare and applied sciences are catching up.
- Perception to AI generated content emerged as a new field of research under consumer neuropsychology.
- Flexibly combining biosensors allows for the study of similar topics in a lab, remote and real world environment in applied sciences.
- Modalities such as Voice analysis and fNIRs are promising emerging candidates for multimodal biometric research.