Table

Overview of the Results of the Scoping Review

No.	Publication	Title	(Visual) attention aspects	Cognitive / mental workload aspects	Other cognitive concepts	Sample sizes with gender distribution	Setting / Task	Professional background
1	Akhmetov and Varol (2023)	An augmented reality-based warning system for enhanced safety in industrial settings	**attention**: gaze points with AI-based object recognition			experiment 1: *N* = 9 (f = 2; m = 7) experiment 2: *N* = 30 (f = 15; m = 15)	manufacturing	university students / faculty members
2	Al-Haddad et al. (2022)	Complexity, performance, and search efficiency: an eye-tracking study on assembly-based tasks among construction workers (pipefitters).			**search efficiency**: convex hulls (based on fixations)	*N* = 20	assembly	workers
3	An et al. (2024)	Skill learning in robot-assisted micro-manipulation through human demonstrations with attention guidance	**(visual) attention**: fixation points and durations; heat maps; gaze trajectory	**cognitive load**: index of pupillary activity (IPA)		*N* = 10	assembly (with joystick)	experts and novices
4	Bales et al. (2017)	Digitalization of human operations in the age of cyber manufacturing: sensorimotor analysis of manual grinding performance	**visual attention**: pooled fixation; duration and variance of fixations; distributed fixation frequency and gaze variation; relation between eye movements, tool velocity and grinding force			*N* = 4	manufacturing (grinding)	students
5	Biondi et al. (2023)	On the potential of pupil size as a metric of physical fatigue during a repeated handle push/pull task		**cognitive load (interaction with physical fatigue)**: pupil size; blink rate		*N = 24* *(f = 11; m = 13)*	manufacturing (push/pull task)	university students
6	Biondi, Saberi et al. (2023)	Distracted worker: Using pupil size and blink rate to detect cognitive load during manufacturing tasks		**cognitive load**: pupil size; blink rate		*N* = 24 (f = 11; m = 13)	manufacturing (push/pull task)	university students

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7	Bläsing and Bornewasser (2021)	Influence of increasing task complexity and use of informational assistance systems on mental workload		**mental workload**: pupillary response; fixation duration; saccadic peak velocity; area of interest (AOI) analysis		*N* = 65 (f = 39; m= different numbers to whole sample size (*n* = 27))	assembly	
8	Capponi et al. (2024)	Assembly complexity and physiological response in human-robot collaboration: Insights from a preliminary experimental analysis		**cognitive load**: pupil size; fixation number and duration; saccade number, duration, peak velocity and amplitude		*N* = 18	assembly (with a cobot)	students
9	Drouot et al. (2022)	Augmented reality on industrial assembly line: Impact on effectiveness and mental workload		**mental workload**: pupil size; blink rate and duration		*N* = 27 (f = 5; m = 22)	assembly	employees from different levels
10	Gelec and Lindenlaub (2024)	Eye-Tracking supported design of digital assistance systems for smart factories	**visual attention**: average fixation duration, AOI analysis; visualization: heatmaps and gaze plots	**cognitive load**: pupil diameter/dilation			manual inspection process (manufacturing)	
11	Gervasi et al. (2024a)	Does size matter? Exploring the effect of cobot size on user experience in human–robot collaboration		**cognitive load**: saccade amplitude, peak velocity of saccades	**learning effect** and **level of user engagement**: pupil diameter	*N* = 32 (f = 27,6%; m = 72,7%)	assembly (with a cobot)	recruited from institute and surroundings
12	Gervasi et al. (2024b)	Eye-tracking support for analyzing human factors in human-robot collaboration during repetitive long-duration assembly processes		**cognitive/mental (work)load**: average pupil diameter, number and average duration of fixations, number of saccades		*N* = 6 (f = 3; m = 3); only eye-tracking data of 4 was used	assembly (with a cobot)	
13	Grandi et al. (2020)	A Transdisciplinary digital approach for tractor's human-centred design		**mental workload**: pupil diameter			manufacturing/ assembly/ disassembly	
14	Hock and Metternich (2024)	Using metrics for the assessment of human interaction with worker assistance systems			**information perception**: dwell count; AOI analysis: fixation durations and revisits		assembly/ production	no information

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15	Hopko et al. (2024)	Brain-behavior relationships of trust in shared space human-robot collaboration			**trust** and **bottom-up processing**: AOIs, stationary gaze entropy (based on fixations) and gaze transition entropy	*N* = 38 (m = 18; f = 20) (*n* = 32 for eye-tracking data)	assembly (with a cobot)	university population
16	Liu et al. (2024)	The effects of type and form of collaborative robots in manufacturing on trustworthiness, risk perceived, and acceptance	**attentional resources**: fixation counts and durations	**mental effort**: fixation counts and durations		*N* = 40 (f = 20; m = 20)	manufacturing (pick and place with a cobot)	mainly university students
17	Lucas and Pandya (2021)	Multirobot confidence and behavior modeling: An evaluation of semiautonomous task performance and efficiency	**attention**: fixations			*N* = 12 (f = 3; m = 9)	robot control	
18	Lystbæk et al. (2024)	Spatial gaze markers: Supporting effective task switching in augmented reality	**attention shift detection**: fixations, AOIs (not directly mentioned)		**visual search**: fixations	*N* =20 (f = 6; m = 13; other = 1)	assembly/repair/ inspection	mainly university students
19	Ma et al. (2024)	Determining cognitive workload using physiological measurements: pupillometry and heart-rate variability		**cognitive workload**: pupil diameter		*N* = 25 (f = 9; m = 16)	assembly/ manufacturing	
20	Mingardi et al. (2020)	Assessment of implicit and explicit measures of mental workload in working situations: Implications for industry 4.0		**mental workload**: pupil diameter, blink duration and frequency, fixation duration and frequency, saccade duration and frequency and nearest neighbor index (NNI),		*N* = 30 (f = 16)	assembly/ manufacturing	mainly young adults

No.	Publication	Title	(Visual) attention aspects	Cognitive / mental workload aspects	Other cognitive concepts	Sample sizes with gender distribution	Setting / Task	Professional background
21	Morgenstern et al. (2024)	Towards a cognition-based framework describing interdisciplinary expert team processes for cognitive robotics in industry 5.0 technologies	**(visual) attention**: fixations		**situational awareness**: fixation proportions (summed fixation durations) and AOIs	*N* = 3 (f = 1; m = 2)	manufacturing (process) (with a robot)	employees of a Fraunhofer Institute
22	Nandakumar et al. (2014)	Real time assessment of stress level of workers in factories by measuring their eye parameters		**cognitive workload**: pupil diameter		*N* = 45	manufacturing	workers
23	Ozkan and Ulutas (2016)	Use of an eye-tracker to assess workers in ceramic tile surface defect detection	**attentional aspects of performance**: time to first fixation, total and average fixation duration, (average) fixation count, total and average visit duration, visit count			*N* = 2 (f = 2)	inspection/ classification (manufacturing)	workers
24	Paletta et al. (2019)	Gaze-based human factors measurements for the evaluation of intuitive human-robot collaboration in real-time.	**attention**: areas of interaction		**concentration**: fixation rate on the areas of interaction	*N* = 20 (f = 8; m = 12)	manufacturing (pick and place with a cobot)	university students
25	Pluchino et al. (2023)	Advanced workstations and collaborative robots: exploiting eye-tracking and cardiac activity indices to unveil senior workers' mental workload in assembly tasks		**mental load**: blink duration and frequency, fixation duration and frequency		*N* = 15 (f = 4) *n* = 11 analyzed	assembly (with a cobot)	workers
26	Sears et al. (2018)	Visualizing eye tracking convex hull areas: A pilot study for understanding how craft workers interpret 2d construction drawings			**amount of information processing**: average convex hulls (based on fixations)	*N* = 20	assembly	workers

No.	Publication	Title	(Visual) attention aspects	Cognitive / mental workload aspects	Other cognitive concepts	Sample sizes with gender distribution	Setting / Task	Professional background
27	Sears et al. (2022)	How pipefitters obtain visual information from construction assembly drawings			**visual information gathering strategies**: visit count and duration (based on fixations in certain AOIs)	*N* = 20	assembly	workers
28	Seeliger et al. (2021)	Exploring the effect of visual cues on eye gaze during AR-guided picking and assembly tasks	**visual attention**: time to first fixation, number of fixations, AOIs, dwell duration, inter-POR distance of scanpath, angular distance			*N* = 12 (f = 6; m = 6)	assembly (with AR cues)	
29	Sonntag and Bodensiek (2022)	How mixed reality shifts visual attention and success in experimental problem solving	**visual attention**: gaze rate in the AOIs; heat maps			*N* = 45	assembly/ building	university students
30	Ulutas et al. (2020)	Application of hidden Markov models to eye tracking data analysis of visual quality inspection operations	**visual attention**: time to first fixation, fixation count and total fixation duration, average visit duration, heat maps for visualization			*N* = 2 (f = 2)	manufacturing/ inspection	workers
31	Van Acker et al. (2020)	Mobile pupillometry in manual assembly: A pilot study exploring the wearability and external validity of a renowned mental workload lab measure		**cognitive load**: pupil size		*N* = 21 (f = 33%) *n* = 19 analyzed	assembly	university students
32	Zanardi et al. (2024)	Pupil responses as indicators of learning and adaptation in human-robot collaboration scenarios		**cognitive load**: average pupil diameter	**learning**: average pupil diameter	*N* = 17 (f = 9; m = 8); 2 removed	assembly (with a cobot)	university students

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