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Mnemonic Techniques for Attentional Regulation and Cognitive Load in Visual Impairment. Perceptions of Future Education and Health Professionals

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Abstract: Within educational settings affected by frequent interruptions, mnemonic techniques may support the organization of learning, raising questions about their perceived relevance to accessible study for learners with visual impairment. Stemming from this premise, an observational study involved 102 university students in education and healthcare programmes, combining an adapted auditory recall task under temporary visual occlusion with a questionnaire about mnemonic techniques. Across the two recall trials, mean performance decreased from 11.13 to 9.92 words out of 15. Regarding self-reported mnemonic use, it correlated positively with immediate and delayed scores, respectively ϱ = .47 and ϱ = .45. Alongside these behavioural associations, agreement reached 78.4% for perceived cognitive-overload reduction and 84.3% for transversal competences, with all participants endorsing emotional engagement as relevant to the activation of learning strategies. On the basis of these findings, participants' favourable perceptions could inform the training of future education and healthcare professionals, although causal conclusions and the application of mnemonic techniques to learners with visual impairment require controlled research using direct measures of the proposed benefits.

Keywords: Visual impairment; Mnemonic techniques; Attentional self-regulation; Cognitive load.

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1. Introduction

Within contemporary learning environments, frequent digital interruptions can involve additional demands on students who must retain an educational goal as competing information becomes available. Especially if the material is unfamiliar and its meaning depends on relationships that have yet to become established in memory during the early stages of study. After a change of task, recovering an earlier intention may require reactivation supported by associative cues, as proposed within a model of goal memory (Altmann & Trafton, 2002). At the level of cognitive control, switching between task requirements produced performance costs (Monsell, 2003), giving transitions a place in explanations of sustained educational engagement.

Closer to everyday digital activity, receiving a mobile-phone notification disrupted performance on an attention-demanding task even in the absence of

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interaction with the device (Stothart et al., 2015), suggesting that an interruption can affect performance before the learner actively responds.

Across the wider media-multitasking literature, cognitive findings have been heterogeneous, and the direction of reported associations remains open (Uncapher & Wagner, 2018), requiring careful interpretation of habitual switching. For educational interpretation, this uncertainty draws attention towards the organization of the activity, including the demands involved in resuming work and the resources a learner can use to recover relevant content after attention has shifted. From a cognitive-load perspective, those demands depend on information complexity in relation to existing knowledge (Sweller et al., 2019). So, a procedure that assists one learner may add effort for another (Sibilio, 2013). With particular reference to element interactivity, instructional support must be evaluated against what the learner can already process as an integrated unit (Sweller, 2010).

In relation to this organizational problem, mnemonic techniques establish meaningful associations with retrieval cues, which provide prompts for recovering learnt information during subsequent attempts at recall. Among the findings relevant to their potential, sustained mnemonic training was associated with durable memory gains and changes in functional brain-network organization (Dresler et al., 2017), although the conditions of that training differ from ordinary classroom practice and leave questions about educational adaptation. With respect to interrupted activity, a mnemonic acronym benefited procedural learning and resumption at particular subtask boundaries (Radović & Manzey, 2019), supporting a limited proposal that cue structure could assist recovery of relevant information under specified conditions.

Alongside these specific benefits, a comparative review found less robust evidence for keyword mnemonics than for practice testing (Dunlosky et al., 2013), which makes the relationship between strategy and task central to an educational interpretation. Within research on retrieval itself, recalling material improved learning more than concept mapping with the text available (Karpicke & Blunt, 2011), under the experimental conditions studied. For learners with limited or absent vision, this distinction also involves access to the material, as a useful retrieval activity still depends on an accessible representation of the content to be learnt. Across studies of imagery and spatial processing, performance varied with task requirements and visual experience (Cattaneo et al., 2008), giving reason to consider individual histories when selecting a mnemonic form instead of assuming a uniform profile of learning needs.

At the level of verbal memory, congenitally blind adults showed enhanced recognition of previously heard words under specific experimental conditions (Röder et al., 2001), with the relevance of this evidence limited to the population and tasks studied. In a related neuroimaging investigation, occipital activation correlated with verbal-memory performance in blind participants (Amedi et al., 2003), illustrating functional flexibility whose educational implications require separate investigation. Within the concept of vicariance, the possibility of achieving an aim by alternative functional means (Berthoz, 2017) provides a way to interpret this flexibility, with the choice of an educational support dependent on the learner's resources and the demands of the activity (Sibilio, 2017).

On a pedagogical level, mnemonic techniques have been discussed as vicarious supports for memory and autonomy in visual impairment (Di Gennaro & Petrillo,

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2026), connecting cognitive organization with participation in learning. In an applied example, the ARGUE mnemonic was investigated as a strategy of argumentative writing with students with visual impairments (Dunn & Pogrund, 2021), offering a situated basis for considering structured verbal support. For inclusive teaching more broadly, extending the opportunities ordinarily available to all learners gives individual adaptation a place within shared educational work (Florian & Black-Hawkins, 2011), a concern that also applies to the practical use of mnemonic strategies. From the learner's position, such use involves perceptions about effort and progress within the interaction of cognition and motivation described in self-regulated learning research (Panadero, 2017), so familiarity with a technique explains only part of its deployment and requires attention to the conditions that encourage students to use it during study. In relation to emotional involvement, achievement-emotion theory connected appraisals of control and value with educational emotions (Pekrun, 2006), providing a rationale for examining engagement separately from the effectiveness of a mnemonic procedure.

Within professional training and development, teachers' attitudes towards inclusion have been shown to vary with disability-related characteristics and available support (Avramidis & Norwich, 2002), indicating that endorsement of a general aim leaves questions about implementation. Across primary-school settings, a further review linked attitudes with training and experience of inclusion (de Boer et al., 2011), while Italian research showed that perceptions and perceived efficacy also varied in relation to the characteristics of the training pathways followed by teacher trainees (Aiello et al., 2017).

These findings make future professionals' perceptions relevant to the training needed for informed choices about educational and care-related support. Among future healthcare professionals, German dental students who reported reservations were more likely to report no previous experience of disability, while two-thirds felt at least somewhat unsure about treating people with severe visual impairment or blindness (Schmidt et al., 2023).

In the specific context of visual impairment, an exploratory Italian study linked direct experience with more favourable attitudes towards inclusion among future support teachers, supporting the relevance of practical contact within professional training (Zappalà & Di Gennaro, 2025). International research further found that, following an introductory special education course, preservice teachers reported greater calmness about including learners with blindness or low vision, whereas receptivity did not change significantly. The authors therefore recommended that future research examine the role of course content and field-based experience in shaping attitudes towards inclusion (Ajuwon et al., 2015).

Stemming from these considerations, the present study examined university students' perceptions of mnemonic contributions to overload reduction and transversal competences, with emotional engagement considered separately and the questionnaire's broader focus on visual impairment providing the educational context for interpretation. Alongside these perceptions, the investigation examined relationships between self-reported mnemonic use and recall performance, keeping the behavioural evidence specific to the participating students as the potential relevance of their perceptions to inclusive practice was explored.

2. Materials and Methods

For the empirical investigation, an exploratory observational study combined an adapted auditory recall task with a questionnaire in 102 university students, whose mean age was 23.70 years with SD = 3.17.

In terms of academic preparation, Psychology contributed 25 participants and Nursing contributed 30, with the remaining students enrolled in Education or Primary Education, comprising 27 and 20 participants respectively. During initial encoding, participants received identical instructions and wore a blindfold for three presentations of a fifteen-word list (each word was presented for 1 sec at a time) using a standardized recording lasting approximately two minutes. Between presentations, an acoustic signal marked the transition. In order to give participants the signal to remove their blindfolds and access the Google Form by QR code, a repeated five-second final signal was provided. Following access, immediate free recall preceded the approximately ten-minute questionnaire and delayed free recall, with two minutes per trial and one point per correct target word regardless of serial position.

In the questionnaire, general five-point items addressed perceived overload reduction and transversal competences. They were situated within a broader focus on visual impairment and analyzed as separate outcomes. Furthermore, in order to address the affective dimension, a separate item examined emotional engagement as a basis for activating learning strategies.

For statistical description, means and standard deviations summarized recall and ratings. A Wilcoxon signed-rank test assessed change between the paired immediate and delayed recall scores.

Finally, in the remaining inferential analyses, Spearman coefficients related recall to self-reported mnemonic use and perceived helpfulness, with further coefficients examining the three perception items, and Kruskal-Wallis tests assessed degree-programme differences for each item rather than a composite score.

3. Results

Across the paired recall observations, the immediate mean was 11.13 words, and the delayed mean was 9.92, with standard deviations of 1.92 and 2.41 respectively, as presented in Table 1. Over the questionnaire interval, the Wilcoxon signed-rank test indicated a significant decrease in recall, $W = 0$ with $p < .001$, alongside substantial delayed performance.

Table 1. Immediate and delayed free recall

Recall assessment	Mean	SD
Immediate recall	11.13	1.92
Delayed recall	9.92	2.41

For both assessments, scores could range from zero to fifteen correct target words, with approximately ten minutes of questionnaire completion between the two free-recall trials.

For self-reported mnemonic use, positive associations were observed with immediate recall at $\rho = .47$ and delayed recall at $\rho = .45$, with both correlations

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reaching $p < .001$ and indicating that higher reported use accompanied higher recall scores. In the corresponding helpfulness analyses, correlations were $\varrho = .49$ for immediate recall and $\varrho = .42$ for delayed recall, with $p < .001$ for both coefficients in Table 2. At the extremes of the reported-use scale, the highest category contained 32 participants and the lowest contained eight, with immediate means of 11.88 and 9.50 words respectively, followed by delayed means of 10.84 and 7.75.

Table 2. Associations between mnemonic engagement and recall

Self-report variable	Immediate recall ϱ	Delayed recall ϱ
Mnemonic use	.47	.45
Perceived helpfulness	.49	.42

For all four associations displayed here, Spearman coefficients were positive and reached $p < .001$, with the two self-report variables considered separately for each recall trial.

Concerning the perception items, agreement with cognitive-overload reduction reached 78.4% and agreement with transversal competences reached 84.3%, with means of 4.24 and 4.23 respectively, alongside the distributions summarized in Table 3. For emotional engagement specifically, all 102 participants selected four or five, producing a mean of 4.47 and a standard deviation of 0.50 within the upper response categories. Across degree programmes, the Kruskal-Wallis analyses yielded statistically undetectable differences in perception ratings, and correlations between these ratings and recall remained small, with absolute ϱ values at or below .13 and p values at or above .20.

Table 3. Perceived educational contributions of mnemonic techniques

Perceived contribution	Mean	SD	Agreement %
Reduction of cognitive overload	4.24	0.79	78.4
Support for transversal competences	4.23	0.70	84.3
Emotional engagement in strategy activation	4.47	0.50	100.0

Taken at the level of the measured outcomes, these analyses describe favorable perceptions alongside associations of recall with reported mnemonic engagement, with the separate item summaries retaining the distinction between educational perceptions and behavioural scores.

4. Discussion

In interpreting the pattern as a whole, favorable perceptions about mnemonics accompanied positive associations between reported use and recall, although these findings address distinct aspects of participants' responses. For the behavioural

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associations, greater reported use could reflect strategic involvement or pre-existing memory differences, and successful performance might itself have influenced perceptions of helpfulness, leaving several plausible explanations for relationships whose direction would require a design capable of separating these possibilities. Against the intervention literature, this distinction separates the present associations from improvement attributable to mnemonic instruction (Dresler et al., 2017), which would require a comparison capable of evaluating change under defined learning conditions.

In reading the decrease between recall trials, the questionnaire and the passage of approximately ten minutes belonged to the same procedure, leaving their separate contributions to later performance undetermined.

At the boundary with inclusive practice, general item wording and temporary visual occlusion restrict application to learners with visual impairment, whose continuing perceptual experience differs from the conditions of this task, and the present sample offers an account of future professionals' perceptions rather than direct evidence of accessible learning outcomes. For professional education, the findings could support discussion of how a proposed mnemonic fits a specific learning activity, with supervised practice allowing students to examine the distance between initial endorsement and an informed choice of support (Di Gennaro et al., 2014). In making that choice, access to a resource must be considered alongside its practical use, with adequate training identified as an implementation concern in research on assistive technology (McNicholl et al., 2021). Across the degree-programme comparisons, statistically undetectable differences provide limited evidence of similarity, particularly with unequal group sizes and restricted rating distributions, and transfer to practicing professionals remains a question for a different sample. As a basis for subsequent research, a comparison between accessible study conditions could test the proposed contribution of mnemonics, with direct measures of attentional continuity and cognitive load needed to evaluate their practical effects.

5. Conclusions

In light of the analysis conducted, the study connects future professionals' perceptions about mnemonic techniques with evidence from a recall task, offering a basis for further inquiry into accessible learning whose scope remains tied to the population and measures examined. From this empirical starting point, the relevant question is how these initially favourable perceptions can be critically examined within professional training and inform reasoned choices about support, sensitive to what a learner is trying to understand and to the demands of the task. Training opportunities that allow future professionals to examine the effort involved in creating and maintaining a retrieval cue may help them assess the practical limits of an apparently useful technique. The same concern applies to educational design, where an association that simplifies access to information may require revision as knowledge develops, and its value would depend on whether the organization continues to support understanding rather than the reproduction of isolated material whose relationship with the educational task has become unclear.

For learners with visual impairment, this evaluation would benefit from shared decisions about accessible forms of support, including opportunities to explain how a particular cue relates to their study experience. In translating that principle into

teaching, an auditory prompt might suit a verbal learning task, and a tactile arrangement might assist the organization of spatial content, with the choice remaining open to the learner's assessment of its usefulness. Beyond the initial sensory format, the question becomes whether the student can use the organization independently and modify it for a later task, which would help relate the proposed support to autonomy in ordinary study. At this stage of educational development, a professional's role would include responding to difficulties in using the strategy, so that continued support could reflect the learner's changing experience with the material.

For the next empirical phase, comparable exposure to content and practice would allow accessible mnemonic support to be examined against another accessible study condition, addressing the contribution of the strategy under defined circumstances. Alongside recall, a direct assessment of resumption after interruption could test the attentional interpretation developed here, and a task-sensitive estimate of cognitive load could clarify the effort experienced during study. At a longer interval, a further assessment would establish whether the organization remains usable beyond the immediate session, with the time available for practice documented to aid interpretation of any changes in performance. Within the design of these assessments, consultation with learners with visual impairment would help establish suitable instructions and response formats, and variation in visual experience would inform interpretation of the conditions under which a strategy proved useful.

For education and healthcare programmes, this work would offer a basis for examining how professional perceptions develop after direct experience with accessible learning activities, linking the perceptions recorded here to subsequent opportunities for informed practice. Concerning the willingness to engage, future inquiry could examine whether appraisals of a strategy influence willingness to practice it, keeping reported engagement distinct from observed participation in learning. When evaluating the educational value of mnemonic techniques, performance data should be considered alongside the cognitive and practical demands involved in their use, so that potentially favourable outcomes can be interpreted in relation to the conditions under which the technique is applied.

Once these observations become available, professional education could use contrasting task examples to examine when a mnemonic cue remains useful and when the teaching arrangement requires adjustment during subsequent practice.

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