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Systematic literature review on the effects of dual tasks on vividness, emotivity of negative and traumatic emotional memories: Working memory and memory consolidation/reconsolidation, an explanatory theoretical articulation?

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ADMINISTRATIVE INFORMATION**Support** - Funding Région Grand Est, France.**Review Stage at time of this submission** - Formal screening of search results against eligibility criteria.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202440065**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 16 April 2024 and was last updated on 16 April 2024.**INTRODUCTION**

Review question / Objective To take stock of studies aimed at assessing the effects of dual tasks on the vividness and emotionality of negative and traumatic emotional memories, as well as on experimentally induced aversive stimuli.

To identify, from among the selected studies, the interventions that, from a methodological point of view, enable us to respond to the articulation of working memory and consolidation/reconsolidation memory theories.

Rationale The administration of dual tasks (e.g. eye movements) for example, making eye movements or playing the Tetris game during the recall of a negative or traumatic emotional memory would reduce the emotional charge associated with this memory. Although the mechanisms of action of these dual tasks are currently the subject of much scientific debate, it would seem that the theories of Memory Consolidation/Reconsolidation

(M-C/R) and Working Memory (WM) can jointly contribute to their understanding.

Condition being studied Disorders related to trauma and stressors.

METHODS

Search strategy The literature searches will be carried out according to the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analysis) guidelines through two databases PubMed and PsycINFO. This review will include all research articles providing quantitative data on the effects of dual tasks on emotionality and vividness associated with aversive and/or traumatic memories as well as those associated with experimentally induced memories.

All articles must be published between January 1, 2000 and January 29, 2024.

Key words will be used such as, for example, working memory, memory consolidation, memory reconsolidation, eye movement desensitization

reprocessing, EMDR, dual taxation, visuospatial task, finger tapping, Tetris, counting, PTSD, stress disorders, traumatic memories, aversive memories, intrusive memories, vividness, emotionality.

Participant or population Inclusion Criteria: Non-clinical participants, i.e. healthy or subclinical individuals. Patients, namely individuals with diagnosed psychiatric disorders linked to trauma or a stressor. All individuals must be over 18 years old/ Exclusion criteria: Studies on animal populations.

Intervention Psychological interventions will be included if they allow the effects of dual tasks to be assessed on the vividness and emotionality of negative and traumatic emotional memories, as well as on experimentally induced aversive stimuli. Furthermore, these interventions should also make it possible to identify whether or not the treatments used are based on an interventional methodology allowing us to respectively articulate the theories of working memory and those of memory consolidation/reconsolidation. These include: • Types of memory, i.e. aversive or traumatic autobiographical emotional memories and aversive stimuli presented experimentally, • Types of tasks having a saturation effect on working memory: for example, Visuospatial tasks (eye movements, Tetris, etc.), Phonological tasks (binaural stimulations), Complex tasks (counting, etc.) • Intervention Protocol: the protocol must include the recovery of a memory: as well as the Administration of a dual task • Timing: Timing of administration of the dual tasks must be defined (during, immediately after, 10 minutes after the recall of the memory) as well as the duration of the intervention, • Number of recalls: single or multiple retrieval of the same memory during the intervention. Exclusion criteria: Case studies and treatment studies, for example the application of a standard EMDR protocol.

Comparator The interventions will be compared to: • A control group not exposed to the application of dual tasks during the recall of aversive, traumatic or experimentally induced memory. • A dual-task condition: any intervention mobilizing the application of a dual task (binaural stimulation, tactile stimulation, visual stimulation) during memory recall.

Study designs to be included Inclusion criteria. We will include clinical trials, experimental laboratory studies and relevant randomized controlled trials. All such studies should involve: pre- and post-test assessment of alertness, emotionality, subjective experience of post-

traumatic stress disorder and/or physiological reactivity associated with negative emotional memories or experimentally induced aversive stimuli. Intra- and inter-subject designs will also be included.

Eligibility criteria The final selection of these articles will be made on the basis of the following eligibility criteria: (1) The population: the study involved non-clinical (i.e. healthy individuals) or sub-clinical and clinical samples, i.e. individuals with diagnosed psychiatric disorders. Individuals must all be over 18 years of age. (2) Targeted memory comprising an experimental modality including autobiographical aversive or traumatic emotional memories as well as experimentally presented aversive stimuli. (3) The type of tasks used to saturate the WM: participants are given visuospatial tasks (eye movements, Tetris, etc.), phonological tasks (binaural stimuli) or complex tasks (counting, etc.). (4) Interventions: participants subjected to the double-task condition are asked to recall the memory and perform double tasks with a memory saturation effect. (5) Timing: the double tasks are administered before, during, immediately after and 10 minutes or more after the memory activation. (6) number of memory activations: participants activate their memory once and perform double tasks, or activate their memory multiple times and perform double tasks at each memory activation.

Information sources Articles citing articles that have been identified as well as articles resulting from a hand search will also be examined to determine if these can also be included in this review.

If the data from a study proves not to be published, the first author will be contacted. The result of this study will then be added to the summary table of studies included in the review.

Main outcome(s) – Emotionality and vividness associated with intrusive memories: Changes and differences between groups in self-reported subjective measures of vividness and emotionality e.g. using visual analogue scale, Subjective Units of Disturbance Scale (SUD) (Wolpe, 1969), Lickert scale ... from pre-intervention to post-intervention.

Additional outcome(s) 1. Symptoms of PTSD: Changes and group differences in self-reported PTSD symptoms using a standardized measure such as the Impact of Events Scale-Revised (IES-R) (Brunet et al., 2003; Weiss & Marmar, 1997) from pre-intervention to post-intervention.

2. Intrusive memories: Changes and differences between groups in the severity and/or number of intrusion symptoms, e.g., an intrusion diary.

3. Objective memory performance: Changes and differences between groups in memory performance, e.g. by measuring reaction times, memory accuracy or psychophysiological measures (skin conductance, heart rate variability) from pre-intervention to post-intervention.

Data management Studies will be selected by the first and second authors. All studies whose titles and abstracts do not meet all the predefined inclusion criteria will be excluded. Full reading of the texts will then be undertaken to define the final inclusion of studies in the systematic review undertaken. Any disagreement over the inclusion of a study will be resolved by discussion between the two authors in the presence of the supervisors (constituting a third and fourth reviewer).

Data extraction will be carried out by the first author. The data will be extracted into a Microsoft Excel file and will include :

- Authors, year of publication, country in which the study was conducted,
- Study objectives,
- Population and sample (type and size of target population, whether or not a control group was included, and if so, its size, intervention group and size),
- Study design (type of study and number of experimental conditions),
- Type of memory (experimental modality, timing of memory activation, number of recalls during intervention).
- interventional temporality (timing of task administration, duration of intervention)
- Measurement instruments (types of instruments and timing of measurements)
- Results in relation to the objective of the review.

Quality assessment / Risk of bias analysis The quality of the included studies will be assessed using the analysis grid adapted to prognostic studies. Hayden's criteria were developed specifically to assess the quality of individual studies in systematic prognostic reviews, and to take into account six potential biases (study participation, study drop-out, prognostic factor measurement, outcome measurement and confounding, and analysis). According to these criteria (Hayden et al.; 2006), each domain item is scored as yes, no or partially/unsure. If the majority of responses to items in a domain are yes, the risk bias for that domain will be considered low. If the majority of responses to items are no, the risk bias will be considered high. In the case of uncertain responses, the risk of bias will be considered

moderate. Disagreements will be resolved by discussion until a consensus is reached, or by consultation with a third author.

Strategy of data synthesis A qualitative synthesis will be produced.

Subgroup analysis A qualitative synthesis will be produced.

Sensitivity analysis A qualitative synthesis will be produced.

Country(ies) involved France.

Keywords Working memory; consolidation/reconsolidation memory; eye movement desensitization reprocessing; alternating bilateral stimulation; stress disorders; intrusive memories; vividness; emotivity.

Dissemination plans We intend to publish the review once it is complete.

Contributions of each author

Author 1 - Sarah Lapcevic - The first author to contribute to all stages of revision and to draft the manuscript.

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Author 2 - Julien Bruno-Enzinger - The second author contributes to data selection and the risk of bias assessment strategy.

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