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The Predictive Role of Trauma Exposure, Sleep Quality and Metacognitive Dysfunction in Everyday Memory Functioning - A Multiple Regression Study

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Abstract

Memory is a significant cognitive process shaped by both internal self-regulatory mechanisms and external psychological stimuli. Previous research has discovered that trauma is associated with memory difficulties while poor sleep quality impairs both retrospective and prospective memory. On the other hand, metacognitive dysfunction is associated with increased cognitive complaints and poor self-monitoring of memory performance. The present study explored whether psychological trauma, sleep quality and metacognitive dysfunction predict memory discrepancies in a non-clinical population. While these variables have been extensively researched separately, this research represents the first known attempt to examine them combined within a single predictive model. The research explores how these interrelated factors contribute to everyday difficulties by using cognitive, clinical and neuropsychological frameworks. 130 participants completed four validated self-report measures that assess trauma exposure (International Trauma Questionnaire), sleep quality (Pittsburgh Sleep Quality Index), metacognitive beliefs (Metacognition Questionnaire-30) and memory function (Prospective and Retrospective Memory Questionnaire). All predictor variables were standardized, and a multiple regression analysis was conducted to assess their contributions to memory outcomes, either individually or combined. The overall model was statistically significant and accounted for 30.5% of the variance in memory performance (R2 = .305, p<.001). Metacognitive dysfunction was the strongest predictor, followed by sleep quality. Although psychological trauma was significantly associated with memory at bivariate level, it did not retain predictive value in the full model. These findings suggest that metacognitive beliefs may be more important in perceived memory difficulties than trauma exposure and that sleep exerts an independent effect. Integrating these variables which are often studied separately, this research aims to contribute to a more nuanced and ecologically valid understanding of memory as an active cognitive outcome.

Keywords

memory difficulties, psychological trauma, sleep quality, metacognitive beliefs, self-regulation, multiple regression, cognitive functioning, subjective memory, non-clinical population

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Introduction

Memory is a dynamic ability for adaptation, acquisition and retrieval that extends beyond traditional models, which are so far considered a fixed, subjective mechanism. Current views also emphasize the role of neurochemical processes, like synaptic plasticity and external storage systems like DNA, and digital technology that point to the integration of memory with environment (Briglia et al., 2018).

Early theory provided significant breakthroughs. The Multi-Store Model (Atkinson & Shiffrin, 1968) conceptualized memory as a linear system consisting of sensory memory, short-term memory (STM) and long-term memory (LTM). Expanding beyond this framework, Baddeley & Hitch (1974) proposed the Working Memory Model, including specialized subsystems: central executive (cognitive control), phonological loop (processes verbal information), visuospatial sketchpad (handles visual and spatial processing) and episodic buffer (integrates of different information sources) (Baddeley, 2000). Further classification in memory is explicit (declarative) and implicit (non-declarative) (Tulving, 1972). Explicit memory, which involves conscious recollection, contains both semantic memory (factual knowledge) and episodic memory (memory of personal events). Implicit memory is unconscious and includes procedural memory (coordinates skills and habits) and priming effects. These classifications have affected extensive research on cognitive processes, neurological disorders and stress and suggest that various forms of memory are interconnected and controlled by different cognitive and emotional processes.

Psychologically, memory has a vital role in behavior, learning, emotional regulation and self-identity (Zlotnik & Vansintjan, 2019). Episodic memory constructs identity, whereas emotional memories influence decision-making and survival mechanisms. Neuroscientists have also demonstrated the flexibility of memory in synaptic consolidation and neural plasticity to facilitate continued learning and adaptation. Current studies on genetic and epigenetic indicate that life experiences have the potential to leave molecular imprints on gene expression across generations and further solidify the complexity of memory (Posner et al., 2019). Memory is therefore not only influenced by individual experiences but by an interaction of biological and environmental factors over time.

The function of memory is commonly explained in terms of time frame as recalling information. Prospective memory (PM) has been explained as recalling performing future actions while retrospective memory (RM) entails recalling previously acquired information (Arnold & Bayen, 2019). PM consists of two components: the prospective part which includes that a task must be completed and retrospective component which involves the recall of what constitutes a task and when it should be executed (Maylor et al., 2002).

However, memory does not operate in isolation but is significantly affected by psychological and physiological processes like trauma, sleep and metacognition. Psychological trauma has constantly interfered with cognitive functioning while tending to impair encoding and retrieval of autobiographical memories.

This may affect an individual's capacity to form a coherent sense of past episodes (Kim et al., 2019). Additionally, sleep enhances stability and the accessibility of stored information (Klinzing et al., 2019). Lastly, metacognition may act as a protective factor, enabling individuals to form strategies for coping with memory challenges and enhancing cognitive performance (Siegel & Castel, 2019).

Among these factors, memory processes are highly sensitive to psychological trauma which may change neurobiological mechanisms, long-term disturbances and increase vulnerability to disorders like PTSD and complex PTSD (CPTSD). Trauma has been defined by DSM-5 as exposure to life-threatening situation, serious injury or sexual assault that can lead to PTSD and related disorders (American Psychiatric Association, 2013). Aside from acute stressors, chronic stress and early-life adversities, contribute to dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, and trigger excessive release of cortisol which leads to neurotoxicity in brain regions involved with memory like hippocampus and prefrontal cortex (Lupien et al., 2018; Murphy et al., 2022).

Particularly, reduced hippocampus volume in PTSD individuals, correlated with verbal and episodic memory impairment while according to some studies these impairments might be reversible by interventions such as CBT and EMDR (Sorg et al., 2021;Swain et al., 2023). Trauma has a general impairment on memory resulting in fragmented and emotionally charged recollections that are difficult to integrate. An examination in trauma-exposed children (N=105) demonstrated that individuals with PTSD reported more sensory-laden and disorganized memories than non-PTSD peers despite similar cognitive abilities. This finding suggests that trauma influences memory structure but not cognitive performance in general (Reed et al., 2024). Furthermore, exposure to traumatic stress has been linked to increased psychological distress, especially in cases of chronic adversity.

A study in foster children discovered high rates of PTSD (31.6%) and CPTSD (22.8%) with the latter group exhibiting higher severity of trauma, higher comorbidity with depression (34.9%), anxiety (26.4%) and enhanced dissociation (28.1%) (Haselgruber et al., 2020). Consistent with this notion, PTSD has been found to correlate prospective and retrospective memory errors, especially during time-based prospective memory tasks that demand strategic attention (Swain et al., 2023;Swain & Takarangi, 2020). Cognitive variability also exacerbates omissions in memory, reflecting uneven cognitive performance (Thompson et al., 2022). Additionally, traumatic experiences are more accurately remembered than non-traumatic events in retrospective memory, but recollection errors are enhanced by negative emotions, especially among individuals with low self-enhancement (Lalande & Bonanno, 2011).

On the other hand, Berntsen and Rubin (2013) challenge the notion that traumatic memories are fragmented or inaccessible in PTSD. They assert that emotional distress enhances both voluntary traumatic recollections, contradicting dissociative amnesia theories found in Horowitz's model (1975;1976) and DSM-5. Traumatic memories tend to become pivotal to personal identity and memory coherence in PTSD may reflect general cognitive deficits rather than trauma-specific disorganization. Also, reduced executive processes might compromise voluntary recall while emotional intensity also impacts the frequency of recollections are retrieved.

In addition to trauma, memory integrity is affected by quality of sleep which refers to the efficiency and consistency of rest, influenced by factors such as duration, latency and nighttime awakenings. Optimal sleep appears to have a brief sleep latency, fewer disruptions and high sleep efficiency whereas poor sleep is associated with cognitive impairments and emotional dysregulation (Carley & Farabi, 2016). Homeostatic pressure regulates sleep which increases the longer one is awake and circadian rhythms controlled by the superchiasmatic nucleus of the brain aligning sleep-awake cycles with environmental light-dark patterns (Geva-Sagiv & Nir, 2019).

Sleep functions in ultradian cycles, which alternate between non-rapid eye movement (NREM) and rapid-eye movement (REM) stages. The slow-wave sleep (SWS), especially in NREM, stabilizes memory consolidation by reinforcing hippocampal traces, while emotion and procedural memories are refined by REM (Klinzing et al., 2019). Disruptions in this cycle may impair learning, recall and emotion processing. For more than a century, researchers have examined the link between sleep and memory. Early research conducted by Jenkins and Dallenbach (1924) demonstrated that participants could recall information better after sleep compared to wakefulness. Since then, research has validated that sleep protects memory loss and improves retention (Walker & Stickgold, 2006). Sleep neural replay consolidates recently acquired knowledge embedding it in long-term memory. Oscillatory mechanisms required to accomplish this by including slow waves, spindles and ripples regulate this consolidation and make sleep critical in the formation of stable memories (Geva-Sagiv & Nir, 2019).

Both RM and PM rely on sleep to be successfully consolidated, with every stage of sleep involved in different processes of memory. Dual process hypothesis suggests that declarative memory is promoted by NREM sleep while procedural and emotional memory are enhanced by REM sleep. Sequential hypothesis formulates that consolidation and stabilization of memory is mediated by the integration of both REM and NREM sleep (Leong et al., 2019). Hippocampal-cortical communication during slow oscillations, spindles and sharp-wave ripples of NREM sleep solidify novel information from short to long-term memory. REM sleep is, however, linked with refinement of memories such as their insertion into a schema, and selective forgetting (Schmidt et al., 2024).

Sleep deprivation adversely affects these systems, yielding impaired memory encoding, attention, and executive functions, with long-term consequences that may persist beyond brief recovery periods. Studies show that sleep deprivation is linked to impaired sustained attention and response speed, with specific effects on prospective memory (Barner et al., 2017). Moreover, participants with poorer sleep quality perform worse on prospective memory performance especially when sleep disturbance and daytime sleepiness occur (Schmidt et al., 2024).

Although most evidence suggests that sleep is critical in PM and RM consolidation, heterogeneity of memory task complexity, as well as variability in methodology to measure objective and subjective sleep, compromises generalizability. This means that subjects will experience short-term enhancements in the controlled conditions of sleep such as laboratories (Lipinska et al. 2022; Aaron et al., 2019). Evidence remains ambiguous, with research suggesting that there is no significant correlation between sleep quality and PM other than in some sleep disorders, including narcolepsy (Schmidt et al., 2024).

Sleep disturbance is not only associated with cognitive disruption but also very closely related to psychological distress. Trauma survivors tend to experience sleep disturbances such as insomnia, interrupted REM sleep and nightmares, all of which have been identified as the characteristic symptoms of PTSD (Mysliwiec et al., 2018). According to research soldiers and sexual assault survivors reported exceptionally high levels of insomnia and nightmares. Sleep analysis identifies that they spend less time in deep sleep (N3) and more time in lighter stages (N1), lowering overall sleep quality (Kobayashi & Howell, 2018;Seda et al., 2015). Longitudinal evidence confirms that low sleep quality extends PTSD symptoms and reduces psychological resilience to new stressors while strengthening existing trauma-related neural pathways (Aaron et al., 2019).

Another factor complicating exacerbation of sleep disorders might be mood and anxiety disorders and substance use disorders that are usually comorbid with PTSD (Brownlow et al., 2015; Kobayashi & Howell, 2018). Evidence further supports the fact that several trauma survivors develop a fear response upon exposure to sleep-related stimuli such as darkness eliciting heightened vigilance and disturbed rest (Kobayashi & Howell, 2018). Furthermore, depression accounts for 62% variance in sleep disturbance and twin research suggest common genetic susceptibility to sleep disorders and PTSD further complicating causal interpretations (Aaron et al., 2019; Seda et al., 2015).

However, even though trauma has been long established as a sleep disruptor, research suggests that acute sleep deprivation following a traumatic experience might lower PTSD symptoms. Specifically, sleep suppression during the first night after the traumatic incident may reduce the consolidation of intrusive memories potentially lowering subsequent distress (Larson et al., 2023; Kleim et al., 2016). This effect has been associated with the role of REM sleep in emotional memory processing since sleep deprivation appears to disrupt the neural processes that stabilize traumatic memories (Denis et al., 2021).

Trauma and sleep quality thus directly affect cognitive outcomes, metacognitive processes will have an impact as well on the way individuals may adapt and respond to those challenges. Metacognition is particularly important in addition to its significance in learning and decision-making as it enables individuals to assess the accuracy of their recalls, modify retrieval processes, and enhance encoding processes (Azevedo, 2020). Metacognition can be described as the ability to monitor and regulate one's cognitive processes, which is required for cognitive flexibility and self-regulation (Flavell, 1979). The theory consists of three components: metacognitive knowledge (awareness of cognitive abilities), metacognitive strategies (deliberate regulation of cognition) and metacognitive experiences (subjective judgments during cognitive tasks) (Norman et al., 2019). Cognitive performance is improved in several domains by metacognition by guiding both internal memory processes and external memory reliance (Risko & Dunn, 2015).

Similarly, cognitive impairments have been linked to deficits in metacognitive awareness. Bampa and colleagues (2024) investigated metacognition in patients with amnestic mild cognitive impairment (aMCI) and discovered that aMCI patients rated their memory and attention abilities significantly lower than healthy controls despite reporting similar use of cognitive strategies. This suggests that metacognitive impairment might compromise memory through alteration of self-assessment and strategy application. Empirical evidence suggests that individuals use metacognitive judgements in deciding their memory ability and this can influence their capacity to effectively encode, retrieve and respond to remembered information (Siegel & Castel, 2019). Therefore, accurate self-awareness of memory abilities allows individuals to employ effective strategies to remember past experiences (RM) and executing future plans (PM). Nevertheless, the relationship between metacognition and memory is complex whereas metacognitive awareness might improve memory performance is not always reliable, and in some cases, it may interfere with effective memory regulation (Risko & Dunn, 2015).

Further evidence is provided by studies indicating that metacognitive monitoring may enhance PM and RM performance. Scarampi and colleagues (2024) concluded that older adults who performed lower on laboratory-based PM tasks performed better in naturalistic PM tasks. Enhanced performance likely results from the ability to use metacognitive techniques such as external reminders. Hence it can be concluded that metacognitive awareness allows individuals to successfully adjust for cognitive decline, thereby improving memory performance in real-world situations (Giugliano et al., 2022). Similarly, Schnitzspahn and colleagues (2010) discovered relatively accurate predictors of PM performance, especially when making delayed judgements of learnings (JOLs) rather than immediate ones. This aligns with the findings from RM research where delayed metacognitive judgements were more accurate, substantiating the argument that metacognitive reflection enhances memory consolidation.

Despite that, not all studies support the fact that metacognition will always enhance memory performance. Morphew (2020) argues that low-performance individuals tended to be overconfident in the valuation of their metacognitive processes, and they did not improve their accuracy even after receiving feedback. Surprisingly, providing feedback on monitoring accuracy resulted in even more confidence, implying that metacognition may not always lead to better memory regulation-instead may enhance inaccurate self-assessment. This is in line with the Dunning-Kruger effect, where individuals with lower cognitive abilities overestimate themselves. So, while metacognition may enhance memory function, its effectiveness is reliant on the individuals' ability to accurately assess their own cognitive processes (Mahmood, 2016).

The novelty of the current study lies in the fact that for the first time variables such as trauma, sleep quality, metacognition and memory are examined together. Although extensive research has examined these variables in isolation or in pairs, no existing studies have investigated their combined effects on memory performance. Prior research has predominantly focused on clinical populations (Gvozdanovic et al., 2017) leaving a gap in understanding how these variables interact in non-clinical groups. Additionally, while trauma is known to impair both sleep (Brown et al., 2015) and memory (Brewin et al., 2007) it remains unclear whether metacognition functions as a protective factor in this context. Given its role in cognitive monitoring and self-regulation (Akturk & Sahin, 2011), metacognition could buffer the impact of trauma on memory although this relationship has not been empirically tested. The present study aims to address this gap by using a multiple regression approach to assess these variables together for the first time in a non-clinical population. The findings are expected to extend the existing knowledge base and potentially contribute to appropriate interventions.

Subsequently, the study aims to examine the predictive role of psychological trauma, sleep quality, and metacognition on memory functioning. The hypotheses are that higher levels of psychological trauma (H1) and poor sleep quality (H2) will significantly predict lower memory performance, the higher metacognitive ability will significantly predict better memory performance (H3) and psychological trauma, sleep quality and metacognition will collectively explain a significant proportion of variance in memory performance (H4). Conversely, the null hypothesis proposes that these variables will have no significant predictive effects on memory performance.

This dissertation consists of six chapters. Firstly, the theoretical foundation of the study is presented as well as the research objectives. Secondly, an in-depth literature review, existing theories and research are provided. Thirdly, description of methodology including study design, sample description and measurement instruments. Fourthly, results of the regression analysis are presented and fifthly the findings of the research are being discussed in relation to prior research. Finally, the last section summarizes the key conclusions and suggests directions for future research.

Method

Design

The study uses multiple linear regression design to examine if the predictor variables psychological trauma, sleep quality and metacognition can significantly predict the outcome of memory performance. Multiple regression (MR) is a widely used statistical method in research that allows for the predictions of outcomes and the identification of relationships among variables within a population (Osbourne, 2000). It is particularly valuable for exploring how multiple independent variables together influence a single dependent variable, thus becoming a popular tool in quantitative and mixed-methods research designs.

Given its popularity and accessibility, Osbourne and Waters (2002) further emphasize the significance of checking key assumptions when applying MR, particularly in social contexts where assumption testing is often overlooked. However, Williams et al., (2013) later reviewed this influential study to clarify two critical misconceptions. First, the incorrect claim that MR requires normally distributed variables and second the oversimplified notion that measurement error necessarily diminishes regression coefficients.

Accurate classification of variables as dependent or independent is required for valid MR analysis, as it ensures conceptual clarity and adherence to statistical assumptions (Neale et al., 1994). The key assumptions of MR were tested and confirmed, in line with established guide (Osbourne & Waters, 2002). Linearity and homoscedasticity were supported by the residuals-predicted scatterplot, which showed a random distribution. Normality of residuals was confirmed through both histogram and a P-P plot. Independence of errors was supported by the Durbin-Watson statistics (1.941) and multicollinearity was not indicated based on condition indices and variance proportions.

Participants

A convenience sampling approach was employed to a total of 157 individuals (Sedwick, 2013). Initially, a group of participants was selected using this method, typically involving individuals such as family, friends and colleagues. To expand the sample, the snowball sampling was subsequently used (Goodman, 1961).

A total of 157 adults were initially recruited. Following the application of inclusion and exclusion criteria the final sample consisted of 130 participants. Inclusion criteria required individuals to be at least 18 years old, understand English language to fill the questionnaires, be aware of one or more personal psychological traumas as defined by ICD-11 or DSM-5 criteria and notice sleep and memory disturbances. Participants with a history of neurological or diagnosed mental and sleep disorder, substance use and medication affecting memory were excluded (Table 1) (see Appendix 1). A priori power analysis conducted in GPower indicated that a minimum sample of 119 was required to detect a small to medium effect (f^2=0.15) with three predictors at α=.05 and 95% power (see Appendix 2).

Table 1. Participant Demographics and Screening Outcomes

Variable	Category / Statistic	Value
Sample Size	N	130
Gender	Male	37 (28.5%)
	Female	93 (71.5%)
Age	Range	18–71 years
	Mean (SD)	33.57 (13.81)

Materials

The current study employs four standardized self-report instruments designed to evaluate memory function, traumatic symptoms, sleep quality and metacognitive dysfunction. The Prospective and Retrospective Memory Questionnaire (PRMQ) consists of 16-items that measure everyday memory failure. It includes two subscales: prospective memory which refers to failure to recall an intended action and retrospective which is about the attempt to recall past information. Responses are rated on a 5-point Likert scale ranging from 1 (Never) to 5 (Very Often). The higher score indicates greater memory difficulty (Arnold & Bayen, 2019) (see Appendix 3). The International Trauma Questionnaire (ITQ) is a 12-item questionnaire adapted to assess PTSD and CPTSD symptoms according to the ICD-11. The questionnaire is divided into two general domains: PTSD symptoms (re-experiencing, avoidance and a sense of current threat) and Disturbances in Self-Organization (DSO) (emotional dysregulation, negative self-concept and interpersonal difficulties). Each item is rated on a 5-point Likert scale ranging from 0 (Not at all) to 4 (Extremely). The ITQ has demonstrated high diagnostic accuracy, particularly in distinguishing between various subtypes of PTSD (Hyland et al., 2017) (see Appendix 4).

The Pittsburgh Sleep Quality Index-Short form (ShortPSQI) measures sleep quality during the past month based on seven distinct components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, sleep medication use and daytime functioning. The components added together to yield a global score between 0 and 21, with scores above 5 generally suggesting poor sleep quality. PSQI is a widely validated and frequently used instrument in research and clinical practice to screen for sleep dysfunction (Mollayeva et al., 2016) (see Appendix 5).

Lastly, the Metacognition Questionnaire-30 (MCQ-30) is administrated to assess maladaptive metacognitive beliefs that influence cognitive and emotional regulation. The instrument consists of five distinct subscales: cognitive confidence, positive beliefs about worry, cognitive self-consciousness, negative beliefs about uncontrollability and danger, and the need to control thoughts. The items are scored on a 4-point Likert scale from 1 (Do not Agree) to 4 (Agree very much) and higher scores indicate higher levels of maladaptive metacognitive processes. The MCQ-30 has also demonstrated its predictive validity for depression and anxiety across different clinical populations (Faija et al., 2020) (see Appendix 6).

Prior to beginning the study each participant received a set of support materials for the sake of developing ethical transparency and informed consent. Specifically, they received a Participant Information Sheet outlining the purpose, procedures, potential risks and confidentiality measures associated with research. Written informed consent was obtained through a Consent Form, which emphasized the voluntary nature of participation and the right to withdraw at any time without penalty. At the conclusion of the research, participants received a Debriefing Sheet explaining the research intentions, offering contact information for follow-up questions and provided resources for psychological support if needed. Also, a GDPR Compliance Statement was provided to inform participants about data protection standards, explaining data storage, anonymization and the use of their data solely for educational purposes (see Appendix7). Lastly, analysis of the data was performed using IBM SPSS Statistics (Version 29) on a personal computer. All data were stored on a password-protected USB flash drive and maintained in accordance with the University's data protection prerequisites. Data anonymization and scheduled for deletion upon completion of the research, as outlined in ethics protocol.

Procedure

Data was collected through an online survey generated on Google Forms and distributed via social media platforms (Facebook and Instagram) with additional face-to-face recruitment. The questionnaires took approximately 15 minutes to complete. When participants accessed the form, they were presented with the information sheet, the consent form and a debriefing statement all developed in compliance with British Psychological Society (BPS) ethical guidelines. Participants were informed about the study's aim, their voluntary participation, their ability to withdraw within two weeks of participation and the measures in place to ensure data anonymity and confidentiality. Contact information from the researcher and supervisor was also provided. To enable anonymous tracking, participants were requested to generate a unique identifier by adding the last three letters of their surname and the last three digits of their phone number. The sequence of the four questionnaires were presented as follows: first the ITQ, second the PSQI, third the MCQ-30 and lastly the PRMQ. Upon completion, participants were presented with a debriefing message that reaffirmed their ethical rights and offered final study contact details.

Data Analysis

Descriptive statistics were computed to summarize demographic variables including age, gender and exclusion criteria. Each questionnaire was scored based on established guidelines. Firstly, the ITQ was scored based on the ICD-11 criteria, providing PTSD and DSO scores separately. A symptom cluster was considered present if at least one item within a domain received a score of 2 or higher, along with endorsement of functional impairment. Second, the ShortPSQI comprises seven items, rated on a scale from 0 to 3; these are summed to provide a global sleep quality score ranging from 0 to 21, with any score above 5 indicating poor sleep quality. Thirdly, the MCQ-30 has five subscales with six items each that are scored 1 to 4. Total metacognitive belief score was obtained by adding all 30 items and deriving a possible score range of 30 to 120 with higher scores indicating more metacognitive dysfunctions. Lastly, the PRMQ has 8 prospective memory items and 8 retrospective memory items. The subscale scores per individual were summed separately prior to being combined to yield a total memory score ranging from 16 to 80.

Ethics

The current research adhered to the British Psychological Society (BPS) and receive full ethical approval prior to data collection. Certain precautions were taken during research to ensure participant anonymity, data security and psychological well-being. Access to collected data was restricted exclusively only to the researcher and academic supervisor and securely stored in encrypted digital formats and in physical locked premises. Participants engaged with sensitive topics of trauma, sleep and memory and thus measures to minimize possible distress were taken. This involved the emphasis that the research aimed to identify general patterns rather than evaluating individual abilities. Anonymity was ensured by a coding system that did not include real names and set specific timelines for data retention. Ethical considerations were emphasized throughout every stage to ensure the dignity, privacy and autonomy of the participants, without however compromising the transparency in the use of findings.

Results

Descriptive statistics were calculated for memory performance (PRMQ), psychological trauma (ITQ), sleep quality (PSQI) and metacognitive dysfunction (MCQ-30) (see Appendix 8). The sample consisted of 130 participants (71.5% female), with an average age of 33.57 years (*SD*=13.81) (see Appendix 9,10). The mean PRMQ score was 42.09 (*SD*=12.82), reflecting self-reported memory concerns for non-clinical populations. All predictors were standardized (z-scores) prior to analysis to ensure comparability. These initial figures help frame the dataset and contextualize the patterns observed in the regression model (see Appendix 11).

The original (unstandardized) scores are presented in Table 2 with higher values presenting greater severity in each construct.

Table 2. Descriptive Statistics for Study Variables (N=130)

Variable	Mean	Standard Deviation	Value
ITQ (Psychological Trauma)	26.45	15.12	130
PSQI (Sleep Quality)	7.36	3.90	130
MCQ (Metacognition)	55.00	14.87	130
PRMQ (Memory Performance)	42.09	12.82	130

Correlation analysis revealed several significant relationships between variables. Metacognitive dysfunction was positively associated with memory complications (r= .504), p< .001), suggesting that individuals with more maladaptive metacognitive beliefs tended to report greater daily memory difficulties. In addition, sleep quality was also significantly related to memory complaints (r= .370, p<.001), implying worse sleep quality was associated with more memory problems at the bivariate level. Psychological trauma was also significantly correlated with memory (r= .451, p< .001), suggesting that higher trauma exposure was associated with poorer memory performance when measured solely as variable (see Appendix 12).

Interestingly, trauma and sleep were also moderately correlated (r= .533, p<. 001), in line with previous research showing that trauma often disrupts sleep patterns (Nardo et al., 2015). This overlap in variance suggests that the impact of trauma on memory may be partially mediated by its association with sleep problems (see Appendix 13). Together, these correlations provided a solid foundation for including all three predictors in the regression model.

A standard multiple regression was then conducted to examine whether trauma, sleep quality and metacognitive dysfunction could predict memory performance. The model was statistically significant F (3,126)= 18.418, p<.001 and explained approximately 30.5% of the variance in memory scores (R^2= .305, Adjusted R^2= .288) (see Appendix 14). This represents a moderate effect size (Cohen, 1988) and suggests that the three predictors collectively have a significant relationship with self-reported memory difficulties.

Examining the individual predictors, metacognitive dysfunction made the strongest contribution to the model (β= .381, t= 3.76, p< .001). This finding indicates that individuals with more maladaptive metacognitive beliefs (higher MCQ-30 scores) are likely to report greater memory issues. Sleep quality also significantly predicted memory performance (β= .201, t= 2.29, p= .024), supporting the idea that poor sleep is linked to cognitive difficulties. In contrast, psychological trauma did not significantly predict memory scores once the other variables were considered (β= .084, t= 0.744, p= .458). Although trauma was correlated with memory at the bivariate level, it did not contribute to the overall model (see Appendix 15). This suggests that the apparent impact of trauma on memory may overlap with or be accounted for by other factors in the model, particularly sleep quality.

Before interpreting the results further, several diagnostic checks were carried out to ensure the reliability of the regression model. Visual inspection of the histogram and P-P plot suggested that residuals were normally distributed, and the scatterplot of standardized residuals showed no clear patterns of heteroscedasticity or non-linearity (see Appendix 16,17,18). The Durbin-Watson value of 1.941 demonstrates that the assumption of independent errors had been met (Kabaila et al., 2020). Multicollinearity was not a concern in this model. All variance inflation factors (VIF) values were significantly lower than the standard threshold of 5 and tolerance values remained consistent above .4 (Field, 2017). Additional collinearity diagnostics confirm that the predictors did not excessively overlap in the variance they shared with the outcome (see Appendix 19). This supports the statistical independence of predictors and reinforces the stability of the regression estimates.

Finally, potential outliers and influential cases were checked. Standardized residuals ranged between -2.25 and +2.53, which is well within the generally accepted range of ±3. Cook's Distance value ranged from 0.000 to 0.133, remaining well below the conventional threshold of 1. This suggests that no individual cases exerted disproportionate influence on the regression model (Khan et al., 2025) (see Appendix 20).

Discussion

The objective of the current study was to analyze the extent to which psychological trauma, sleep quality and metacognition are significant predictors of memory functioning in a non-clinical population. The multiple regression showed that the variables explained 30.5% of the memory score variance and consequently had a moderate effect size and indicate that these psychological variables in combination contribute to everyday memory function. These results provide support to H4, which predicted that psychological trauma, sleep quality and metacognitive dysfunction could collectively, account for a significant proportion of variance in daily memory difficulties. Metacognition was the strongest unique association with memory among the three predictors, followed by sleep quality. By comparison, although psychological trauma was highly correlated with memory at the bivariate level, it did not emerge as a predictor when tested in conjunction with the other variables, these results offer partial support for the research hypotheses: increased metacognitive dysfunction and decreased sleep quality were related with worse daily memory performance, but trauma was not a significant predictor of memory. Although the regression model suggests predictive relationships, causal conclusions should be drawn since the study is cross-sectional and non-experimental.

Despite the presence of a negative correlation at the bivariate level between trauma and memory, it did not emerge as a unique predictor in the regression model. Thus, H1, which supported that higher trauma exposure would significantly predict worse memory function, was not supported. These findings appear to contradict current theories which characterize trauma as a negative impact on memory, especially for episodic and autobiographical recall. Trauma-related changes in the hippocampus and HPA axis dysregulation have been associated with encoding and retrieval deficits (Lupien et al., 2018; Murphy et al., 2022). Furthermore, clinical research indicates that PTSD patients have verbal memory deficits along with disorganized memory recalls (Swain et al., 2023; Sorg et al.,2021). Such effects, however, may not extend to non-clinical populations or to measures of everyday memory performance. Contemporary studies increasingly challenge the notion that trauma necessarily leads to global memory deficits. Berntsen and Rubin (2014) argue that traumatic events tend to create emotionally charged memories that are recalled automatically and, in some cases, are more accessible than non-traumatic ones. This viewpoint challenges earlier models, including Horowitz's (1976), which posits that trauma results in fragmented or suppressed memories.

From this other perspective, the absence of a significant predictive influence in the present research may reflect that trauma will not always reduce memory performance; under some circumstances it may actually enhance it. As Sachschal and colleagues (2019) argued, disjointedness-memories that feel disconnected or incoherent- predicts trauma symptoms instead of poor recall. As the current study assessed general memory functioning, rather than trauma-specific disorganization, it may have overlooked subtler forms of cognitive disturbance. This result is consistent with the findings of Ugwuanyi and Formella (2024), who reported no significant memory differences between trauma-exposed and non-trauma participants in a non-clinical sample, supporting the possibility that the impact of trauma on memory may be determined by symptom severity, clinical comorbidity and the type of memory examined.

One possible explanation for the limited predictive role of trauma is in its interaction with sleep, which, in contrast to trauma, was direct and consistent associated with memory function. In the present research, participants who exhibit better sleep quality (i.e. lower PSQI scores) also reported fewer memory difficulties (i.e. lower PRMQ scores), a correlation which was significant at both bivariate and multiple regression model. The findings validate H2, that lower sleep quality would be a significant predictor of impaired memory function. Furthermore, this finding supports the assumption that sleep is more than a secondary process and rather is a key contributor to daily memory function, even in non-clinical populations. Sleep's predictive value in this context aligns with a substantial body of literature indicating that memory consolidation occurs during various stages of sleep. Slow-wave sleep (SWS) stabilizes newly acquired declarative information and REM sleep consolidates emotional content and enables abstraction, as the dual-process and sequential hypotheses predict (Klinzing et al., 2019; Geva-Sagiv & Nir, 2019).

Contemporary neurocognitive models help to contextualize this finding. Synaptic homeostasis theory, for example, suggests that sleep reduces excessive neural activity to enhance the stability of memory traces (Tononi & Cirelli, 2014). Similarly, sleep spindles and slow-wave oscillations enable the communication between the neocortex and hippocampus and thereby assist in the process of transferring information to long-term memory (Rasch & Born, 2013; Hahn et al., 2020). Despite being derived from laboratory studies , the current findings suggest that similar processes may manifest in daily, self-report experience. The participants in the present sample were not selected based on clinical sleep or memory issues, and yet in this general population, sleep quality explained a unique portion of variance in memory performance. It is worth mentioning that sleep was conducted by self-report measurements hence may not reflect objective physiological sleep. It has been demonstrated in previous research several discrepancies between self-reported and measured sleep quality in individuals with a history of trauma or high stress levels (Lipinska et al., 2022), which can influence correlations between sleep and memory in subjective assessments.

In addition to its direct role, sleep might also function as mediator between trauma and memory. A moderate correlation was observed between trauma (ITQ scores) and poor sleep quality suggesting that sleep disturbance might be an explanatory factor for the cognitive consequences of trauma (Larson et al., 2023). This aligns with the existing literature demonstrating that trauma, and PTSD specifically, is generally characterized by disturbed sleep patterns and interrupted REM sleep cycles (Mysliwiec et al., 2018; Haselgruber et al., 2020), both of which are critical in the memory consolidation process. Given the influence of trauma was no longer a significant predictor of memory when sleep was added to the model, one potential explanation is that trauma effects were transmitted through changes in sleep architecture; this explanation is consistent with prior research and needs further investigation. Recent findings introduce an additional layer of complexity by indicating that immediate sleep deprivation following trauma exposure will actually buffer against intrusive memory consolidation (Porcheret et al., 2019). Experimental studies using analogue trauma scenarios have presented that sleep delay following a traumatic event will decrease the severity and occurrence of subsequent memories (Cohen et al., 2016). While this would seem to contradict the conventional perspective that sleep is always beneficial for memory, it underlines the need for timing and context. Additionally, careful interpretation is recommended since these studies frequently rely on highly controlled environments, simulated trauma exposure and short-term follow-up. Nonetheless, the findings have significant implications for the role of sleep not only as possible regulator but also as a potential moderator of emotional memory intrusiveness in trauma-exposed individuals (Cohen et al., 2023; Larson et al., 2023).

This study examined the combined influence of trauma, sleep and metacognition on memory, and while each has a significant role, metacognitive dysfunction emerged as the strongest and most consistent predictor. Metacognitive dysfunction was reliable as a predictor both in bivariate and correlational level. This finding supports H3 and suggests that maladaptive metacognitive beliefs of worry, low confidence in performance ability and the perceived need to control thoughts are associated with increased memory difficulties in non-clinical samples. In contrast to trauma, which did not retain significance when the complete regression model was conducted, metacognition retained a unique and significant contribution even after accounting for sleep and trauma. This implies that metacognitive processes can directly affect memory, as well as influence the interpretation and regulation of other psychological stressors.

These findings contrast with Morphew (2020) who argues that individuals with poorer memory performance often overestimated their cognitive abilities. However, Morphew's use of real-time task performance with feedback differs from the current study's broader belief-based MCQ-30 measure. The present findings reflect long-term metacognitive traits rather than state-level monitoring accuracy, and therefore even distorted beliefs, whether unconfident or overconfident may contribute to perceived memory dysfunction. Schnitzspahn and colleagues (2010) observed that delayed metacognitive judgments enhanced PM performance accuracy, in line with the present findings. Despite this, their emphasis on young adults and controlled laboratory-based tasks limits generalizability.

In contrast, the present study investigated everyday memory difficulties in a heterogeneous adult sample, thereby contributing real-world value to the understanding of the role of metacognition. Similarly, Scarampi and colleagues (2024) showed that older adults compensate for cognitive impairment on naturalistic PM tasks using metacognitive strategies.

While supportive, their reliance on retrospective diary data is compromised about recall bias, which was minimized in the current design by the use of standardized measures. The relationship between metacognition, sleep and trauma requires further investigation. Yu and colleagues (2024) discovered that metacognitive dysfunction predicted sleep disturbances in anxious students and particularly through rumination-a result that supports the findings of the present study, where both sleep and metacognition predicted memory, but trauma did not. Yu's sample was, nevertheless, homogeneous (university students with General Anxiety Disorder characteristics), limiting generalizability. Socci and colleagues (2023) also found that insufficient sleep was linked to dysfunctional metacognitive control over thinking. Yet, their cross-sectional design and emphasis on particular bedtime beliefs might not reflect the general metacognitive profile.

The results of the present study indicate that metacognition may not only directly predict memory but also may serve as possible mediator of the trauma-sleep-memory relationship. Trauelsen and colleagues (2019) reported trauma exposure to predict low metacognitive function in individuals with psychosis ,proposing that early trauma may compromise cognitive self-regulation. Although there was no direct impact of trauma on the non-clinical population in this research, the sustained role of metacognition suggests a moderating or interpretive function in shaping the expression of trauma and sleep disturbance as subjective memory deficits.

The novelty of the current research provides new information regarding how psychological trauma, sleep quality and metacognitive dysfunction predict everyday memory performance. It is the first known study to investigate all four variables concurrently in a non-clinical adult population using multiple regression. The results revealed that metacognitive dysfunction was the strongest and most consistent predictor of memory function, followed by sleep quality. Psychological trauma, although significantly correlated with memory at bivariate level, did not uniquely predict memory after other variables were included. These findings suggest that beliefs about one's own thinking abilities may be more influential in shaping memory than previously assumed, while sleep may act as both direct and potentially mediating factor. Collectively, these predictors explained more than 30% of the variance in memory performance, having a moderate effect size.

Several methodological strengths support these findings. The study addresses a substantial gap by synthesizing areas that are usually examined in isolation, offering a more ecological valid understanding of memory in context. The use of standardized validated measures (ITQ, PSQI, MCQ-30, PRMQ) promoted consistency and the use of demographically diverse, sufficiently powered samples and increased generalizability of the findings outside of clinical or student populations. In addition, the regression approach allowed examination of unique contributions while controlling overlapping variance.

However, several limitations should be acknowledged. Cross-sectional design limits causal inference and all measurements relied on self-report, which possibly introduce bias-particularly for subjective constructs like sleep and metacognition. The MCQ-30, while widely used, is not diagnostic specific and might be vulnerable to response bias. Yet, its predictive utility in this context supports its practical effectiveness. Trauma, measured by ITQ, assessed only by symptom presence not type or timing of symptoms, which may have reduced its predictive accuracy. Likewise, the PSQI provides a comprehensive view of sleep over a one-month period but cannot capture night-to-night variability and tends to diverge from objective polysomnographic measures. Lastly, PRMQ is frequently used to assess everyday memory failures but relies on subjective self-report base and may be sensitive to mood or attentional biases. While moderate correlation exists between trauma and sleep, mediation or moderation were not tested. Finally, although the sample met power requirements its modest scale may limit the detection of more subtle effects while it was self-selected and younger in demographics and may have had limitations in representative.

Future research should extend on these findings to determine if metacognitive dysfunction is a moderator or mediator in the relationship between trauma, sleep and memory. Longitudinal studies that may monitor trauma exposure, sleep and metacognition might clarify directionality, albeit with challenges such as participant dropout. The inclusion of objectives instruments like actigraphy for sleep combined with fMRI could clarify whether metacognition modulates hippocampal-prefrontal connectivity during memory tasks. Furthermore, cognitive performance tasks would improve validity, but this involves ethical, logistical and ecological consequences. More specific metacognitive instruments could clarify which components, e.g. confidence vs control, deplete memory in non-clinical populations. Finally, these findings suggest that memory difficulties are not only determined by trauma or poor sleep but rather might be most influenced by how individuals observe, interpret and govern their own cognitive experiences. The present study emphasizes the value of examining memory as a dynamic outcome shaped by both internal regulatory systems and external stimuli. In doing so, the research contributes to a more integrative picture of cognitive processes with implications for both theoretical frameworks and applied psychological practice.

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Appendices

Appendix 1

Participant Exclusion Based on Clinical Diagnoses and Substance use SPSS Output

CLINICAL_DIAGNOSIS

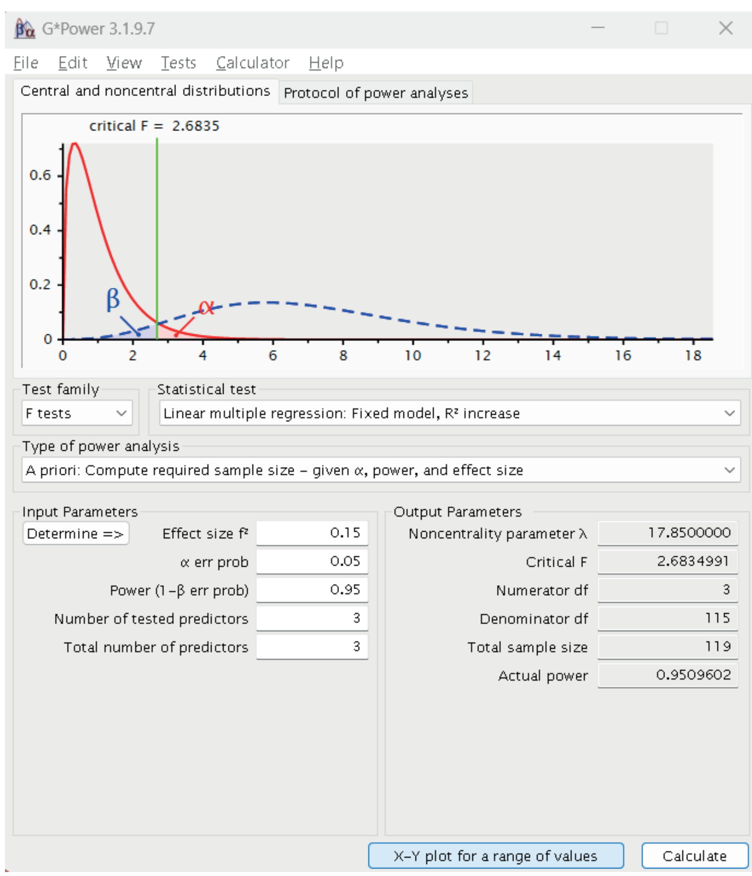
	N	%
NO	130	100.0%
YES	0	0.0%

SUBSTANCE_DISORDERS

	N	%
NO	130	100.0%
YES	0	0.0%

Appendix 2

GPower Output for Sample Size Estimation



Appendix 3

Prospective-Retrospective Memory Questionnaire

REMEMBERING TO DO THINGS

Prospective-Retrospective Memory Questionnaire as described in:

Smith, G., Della Sala, S., Logie, R.H. & Maylor, E.A. (2000). Prospective and Retrospective Memory in Normal Aging and Dementia: A Questionnaire Study. *Memory*, 8, 311-321.

In order to understand why people make memory mistakes, we need to find out about the kinds of mistakes people make, and how often they are made in normal everyday life. We would like you to tell us how often these kind of things happen to you. Please indicate by ticking the appropriate box.

Please make sure you answer all of the questions on both sides of the sheet even if they don't seem entirely applicable to your situation.

Please provide the following details about yourself.	Age ________	Male/Female ________	
How many year of formal education have you had?	________		
Have you suffered from brain or head injury resulting in hospitalisation (Y/N)	________		
Please give brief details ________________________			

Please answer all of the questions as accurately as possible.

	Very Often	Quite Often	Sometimes	Rarely	Never
Do you decide to do something in a few minutes' time and then forget to do it?	☐	☐	☐	☐	☐
Do you fail to recognise a place you have visited before?	☐	☐	☐	☐	☐
Do you fail to do something you were supposed to do a few minutes later even though it's there in front of you, like take a pill or turn off the kettle?	☐	☐	☐	☐	☐
Do you forget something that you were told a few minutes before?	☐	☐	☐	☐	☐
Do you forget appointments if you are not prompted by someone else or by a reminder such as a calendar or diary?	☐	☐	☐	☐	☐
Do you fail to recognise a character in a radio or television show from scene to scene?	☐	☐	☐	☐	☐
Do you forget to buy something you planned to buy, like a birthday card, even when you see the shop?	☐	☐	☐	☐	☐
Do you fail to recall things that have happened to you in the last few days?	☐	☐	☐	☐	☐
Do you repeat the same story to the same person on different occasions?	☐	☐	☐	☐	☐
Do you intend to take something with you, before leaving a room or going out, but minutes later leave it behind, even though it's there in front of you?	☐	☐	☐	☐	☐
Do you mislay something that you have just put down, like a magazine or glasses?	☐	☐	☐	☐	☐
Do you fail to mention or give something to a visitor that you were asked to pass on?	☐	☐	☐	☐	☐
Do you look at something without realising you have seen it moments before?	☐	☐	☐	☐	☐
If you tried to contact a friend or relative who was out, would you forget to try again later?	☐	☐	☐	☐	☐
Do you forget what you watched on television the previous day?	☐	☐	☐	☐	☐
Do you forget to tell someone something you had meant to mention a few minutes ago?	☐	☐	☐	☐	☐

Appendix 4

International Trauma Questionnaire

		Not at all	A little bit	Moderately	Quite a bit	Extremely
1	Having upsetting dreams that replay part of the experience or are clearly related to the experience?	0	1	2	3	4
2	Having powerful images or memories that sometimes come into your mind in which you feel the experience is happening again in the here and now?	0	1	2	3	4
3	Avoiding internal reminders of the experience (for example, thoughts, feelings, or physical sensations)?	0	1	2	3	4
4	Avoiding external reminders of the experience (for example, people, places, conversations, objects, activities, or situations)?	0	1	2	3	4
5	Being "super-alert", watchful, or on guard?	0	1	2	3	4
6	Feeling jumpy or easily startled?	0	1	2	3	4
7	In the past month have the above problems affected your relationships or social life?	0	1	2	3	4
8	Affected your work or ability to work?	0	1	2	3	4
9	Affected any other important part of your life such as parenting, or school or college work, or other important activities?	0	1	2	3	4
10	Below are problems that people who have had stressful or traumatic events sometimes experience. The questions refer to ways you TYPICALLY feel, ways you TYPICALLY think about yourself and ways you TYPICALLY relate to others. Answer the following thinking about how true each statement is of you. When I am upset, it takes me a long time to calm down.	0	1	2	3	4
11	I feel numb or emotionally shut down.	0	1	2	3	4
12	I feel like a failure	0	1	2	3	4
13	I feel worthless.	0	1	2	3	4
14	I feel distant or cut off from people	0	1	2	3	4
15	I find it hard to stay emotionally close to people.	0	1	2	3	4

		Not at all	A little bit	Moderately	Quite a bit	Extremely
16	In the past month, have the above problems in emotions, in beliefs about yourself and in relationships: Created concern or distress about your relationships or social life?	0	1	2	3	4
17	In the past month, have the above problems affected your work or ability to work?	0	1	2	3	4
18	In the past month, have the above problems affected any other important parts of your life such as parenting, or school or college work, or other important activities?	0	1	2	3	4

Appendix 5

Short Pittsburgh Sleep Quality Index

ID #—

Date—

Age—

Instructions. The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for themajority of days and nights in the past month.

Please answer all questions.

(1) During the past month, when have you usually gone to bed?

—

(2) During the past month, how long (in minutes) has it taken you to fall asleep each night?

—

(3) During the past month, when have you usually gotten up in the morning?

—

(4) During the past month, how many actual hours of sleep did you get at night? (This may be different than the number of hours you spend in bed.)

—

For each of the remaining questions, check the one best response. Please answer all questions.

(5) During the past month, how often have you had trouble sleeping because you. . .

(a) Cannot get to sleep within 30 minutes

Not during the past month —

Less than once a week—

Once or twice a week—

Three or more times a week—

(b) Wake up in the middle of the night or early morning

Not during the past month —

Less than once a week—

Once or twice a week—

Three or more times a week—

(c) Cannot breathe comfortably

Not during the past month —

Less than once a week—

Once or twice a week—

Three or more times a week—

(d) Cough or snore loudly

Not during the past month —

Less than once a week—

Once or twice a week—

Three or more times a week—

(e) Feel too hot

Not during the past month —

Less than once a week—

Once or twice a week—

Three or more times a week—

(f) Have bad dreams

Not during the past month —

Less than once a week—

Once or twice a week—

Three or more times a week—

(g) Have pain

Not during the past month —

Less than once a week—

Once or twice a week—

Three or more times a week—

(6) During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Not during the past month —

Less than once a week—

Once or twice a week—

Three or more times a week—

(7) During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?

Not during the past month —

8 Sleep Disorders

Less than once a week—

Once or twice a week—

Three or more times a week—

Appendix 6

Metacognition Questionnaire 30

TABLE 3.4

METACOGNITIONS QUESTIONNAIRE 30

This questionnaire is concerned with beliefs people have about their thinking. Listed below are a number of beliefs that people have expressed. Please read each item and say how much you *generally* agree with it by circling the appropriate number. Please respond to all the items; there are no right or wrong answers.

	Do not agree	*Agree slightly*	*Agree moderately*	*Agree very much*
1. Worrying helps me to avoid problems in the future	1	2	3	4
2. My worrying is dangerous for me	1	2	3	4
3. I think a lot about my thoughts	1	2	3	4
4. I could make myself sick with worrying	1	2	3	4
5. I am aware of the way my mind works when I am thinking through a problem	1	2	3	4
6. If I did not control a worrying thought, and then it happened, it would be my fault	1	2	3	4
7. I need to worry in order to remain organized	1	2	3	4
8. I have little confidence in my memory for words and names	1	2	3	4
9. My worrying thoughts persist, no matter how I try to stop them	1	2	3	4
10 Worrying helps me to get things sorted out in my mind	1	2	3	4
11. I cannot ignore my worrying thoughts	1	2	3	4
12. I monitor my thoughts	1	2	3	4
13. I should be in control of my thoughts all of the time	1	2	3	4
14. My memory can mislead me at times	1	2	3	4
15. My worrying could make me go mad	1	2	3	4
16. I am constantly aware of my thinking	1	2	3	4
17. I have a poor memory	1	2	3	4
18. I pay close attention to the way my mind works	1	2	3	4
19. Worrying helps me cope	1	2	3	4
20. Not being able to control my thoughts is a sign of weakness	1	2	3	4
21. When I start worrying, I cannot stop	1	2	3	4
22. I will be punished for not controlling certain thoughts	1	2	3	4
23. Worrying helps me to solve problems	1	2	3	4
24. I have little confidence in my memory for places	1	2	3	4
25. It is bad to think certain thoughts	1	2	3	4
26. I do not trust my memory	1	2	3	4
27. If I could not control my thoughts, I would not be able to function	1	2	3	4
28. I need to worry, in order to work well	1	2	3	4
29. I have little confidence in my memory for actions	1	2	3	4
30. I constantly examine my thoughts	1	2	3	4

Appendix 7

Participant Information

Study title: Psychological Trauma, Metacognition and Sleep Quality: Predicting Memory Processes Through Multiple Regression Analysis.

What is the purpose of the study?

You are invited to take part in a research study which we are conducting as part of our degree in psychology at the University of Derby. The study is investigating the influence of personal trauma along with sleep quality and metacognition and how these factors might affect memory functions.

Do I have to take part?

Your participation is completely voluntary. You can withdraw at any point during the study, without needing to provide an explanation. You can also withdraw your data up to two weeks after taking part; to do this, you will need to contact one of the researchers using the contact details at the end of this document. Your data will be anonymized using a unique code, and you will need to provide this code if you wish to withdraw your data. Your code will be created using the first three letters of your last name followed by the last three digits of your phone number, e.g. KOS014.

What will happen if I take part?

If you agree to participate in the research, you will be asked to fill in the consent form and you will receive instructions about how to participate. Then, you will need to complete four questionnaires the ITQ (International Trauma Questionnaire), the PSQI (Pittsburgh Sleep Quality Index), the MCQ-30 (Metacognition Questionnaire) and the PRMQ (Prospective Retrospective Memory Questionnaire). The entire procedure will expect to take approximately 20 minutes. You will have the opportunity to ask any question about the study or anything relevant that might concern you.

Use of your data and your rights

Privacy notice

Thank you for agreeing to take part in this research project. The information that you supply will be recorded and processed in line with the UK GDPR / Data Protection Act 2018 / EU GDPR.

Data collected will be used by the student researchers to examine relationships between Psychological Trauma, Sleep Quality, Metacognition and Memory Functions. This is part of an undergraduate research methods module project that contributes to BSc in Applied Psychology. The University of Derby is the data controller.

Anonymized data from this project may be used in future publications.

We retain the data for a minimum period of 7 years after such time it will be securely destroyed. Data will not be retained for longer than is necessary.

Our lawful basis for processing this data is your explicit consent.

As a data subject you can request withdrawal of consent within two weeks by contacting one of the researchers named below. After this period data are anonymized, and we will be unable to extract your individual data.

Our Data Protection Officer (DPO) is Mrs Helen Selby on 01332 591954. Alternatively, you can email gdpr@derby.ac.uk.

Further information on how we handle your information and details of our DPO can be found on our website: https://www.derby.ac.uk/its/datagov/privnotice

Additional Information

The supervisor of this project, who also has access to the data, is highly qualified and experienced and has been very careful to discuss with the student processes to ensure the security of your data. An ethics review has been completed by the supervisor on behalf of the College of Health, Psychology and Social Care Research Ethics Committee.

We are obliged to:

- Not seek more information from you than what is essential and necessary for this research.
- Make sure that you are not identified by using ID codes.
- Use your anonymized / pseudonymized data for the purposes of this study and for any relevant publications that arise from it;
- Store data safely in password-protected databases to which only the named researchers have access.

Further information about the project can be obtained from the research students named below.

Researcher Contact Details

Researcher: atha.kontaxi@mc-class.gr
Research Supervisor: p.afendouli@medcollege.edu

Thank you for taking the time to read this information. We hope that you feel able to take part in the study. If you have any further questions about the study, please let us know. If you are happy to take part in the study, please sign the consent form.

Consent Form

Study title: Psychological Trauma, Metacognition and Sleep Quality: Predicting Memory Processes Through Multiple Regression Analysis.

❑ I confirm that I have read and understood the participant information sheet for the above study and have had the opportunity to ask any questions.

❑ Please tick box

❑ I understand that my participation is voluntary, and I am free to withdraw my data up to two weeks after participating without giving any reason.

❑ Please tick box

❑ I agree freely to take part in the study.

❑ Please tick box

Name: ____

Signature: ____

Date: ____

Debrief Sheet

Thank you very much for taking the time to participate in this study.

Study Information

The purpose of this study is to examine the correlation between psychological trauma, sleep quality, and metacognition in memory functions.

Withdrawing Your Data

Your participation is very much appreciated, but if you decide that you would like to withdraw your data from the study then you can do so without needing to give any reason. Please note that this withdrawal must take place within two weeks of your participation.

Date of taking part: ______________________________

Last date of withdrawal: __________________________

You can withdraw your data by contacting any of the researchers, using the contact details below. You will need to provide your unique code; as a reminder, this consists of the last three letters of your last name followed by your three last digits of your phone number, e.g. KOS014.

Researcher Contact Details

Module Leader: Dr Penelope Louka (plouka@medcollege.edu.gr)
Research Supervisor: p.afendouli@medcollege.edu
Researcher: atha.kontaxi@mc-class.gr

Thank you again for your participation.

GDPR

Privacy Notice

Thank you for agreeing to take part in this research project. The information that you supply will be recorded and processed in line with the UK GDPR / Data Protection Act 2018 / EU GDPR.

Data collected will be used by the student researcher to investigate the correlation between psychological trauma, sleep quality and metacognition in memory functions. This is part of an independent research project that contributes to BSc in Applied Psychology. The University of Derby is the data controller.

Anonymized data from this project may be used in future publications.

We retain the data for a minimum period of 7 years after such time it will be securely destroyed. Data will not be retained for longer than is necessary.

Our lawful basis for processing this data is your explicit consent.

[IF DATA COLLECTION INCLUDES SPECIAL CATEGORY DATA INCLUDE THE FOLLOWING: As part of our research we would like to ask questions that are considered special category data. Our lawful basis for processing this data are: Article 6 legitimate interest and Article 9 your explicit consent.]* I give my explicit consent for my details to be used as stipulated above	Yes ❑	No ❑

Additional Information

The supervisor of this project, who also has access to the data, is highly qualified and experienced and has been very careful to discuss with the student processes to ensure the security of your data. An Ethics review has been completed on behalf of the College of Health, Psychology and Social Care Research Ethics Committee by the supervisor and an independent reviewer.

We are obliged to:

- Not seek more information from you than what is essential and necessary for this research.
- Make sure that you are not identified by using ID codes [OR REPLACE WITH: MINIMISE IDENTIFICATION THROUGH THE USE OF PSEUDONYMS];
- Use your anonymized / pseudonymized data for the purposes of this study and for any relevant publications that arise from it;
- Store data safely in password-protected databases to which only the named researchers have access.

Further information about the project can be obtained from the research student Athanasia Kontaxi, atha.kontaxi@mc-class.gr or their research supervisor Panagiota Afendouli, p.afendouli@medcollege.edu.gr, University of Derby, Kedleston Road, Derby, DE22 1GB.

Appendix 8

Descriptive Statistics for Main Study Variables (PRMQ, PSQI, ITQ, MCQ-30) SPSS Output

Descriptive Statistics

	Mean	Std. Deviation	N
PRMQ_GLOBAL	42.09	12.821	130
Zscore(ITQ_GLOBAL)	.0000000	1.00000000	130
Zscore(PSQI_GLOBAL)	.0000000	1.00000000	130
Zscore(MCQ_GLOBAL)	.0000000	1.00000000	130

Appendix 9

Descriptive Statistics for Gender Breakdown (Frequency and Percent) SPSS Output

GENDER

	N	%
MALES	37	28.5%
FEMALES	93	71.5%

Appendix 10

Descriptive Statistics for Participants Age SPSS Output

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AGE	130	18	71	33.57	13.812
Valid N (listwise)	130				

Appendix 11

Regression Model Setup: Variables Entered and Removed SPSS Output

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Zscore (MCQ_GLOBAL), Zscore (PSQI_GLOBAL), Zscore (ITQ_GLOBAL)[b]	.	Enter

a. Dependent Variable: PRMQ_GLOBAL

b. All requested variables entered.

Appendix 12

Correlation Matrix: Trauma, Sleep, Metacognition and Memory SPSS Output

Correlations

		PRMQ_GLOBAL	Zscore (ITQ_GLOBAL)	Zscore (PSQI_GLOBAL)	Zscore (MCQ_GLOBAL)
Pearson Correlation	PRMQ_GLOBAL	1.000	.451	.370	.504
	Zscore(ITQ_GLOBAL)	.451	1.000	.533	.679
	Zscore(PSQI_GLOBAL)	.370	.533	1.000	.325
	Zscore(MCQ_GLOBAL)	.504	.679	.325	1.000
Sig. (1-tailed)	PRMQ_GLOBAL	.	<.001	<.001	<.001
	Zscore(ITQ_GLOBAL)	.000	.	.000	.000
	Zscore(PSQI_GLOBAL)	.000	.000	.	.000
	Zscore(MCQ_GLOBAL)	.000	.000	.000	.
N	PRMQ_GLOBAL	130	130	130	130
	Zscore(ITQ_GLOBAL)	130	130	130	130
	Zscore(PSQI_GLOBAL)	130	130	130	130
	Zscore(MCQ_GLOBAL)	130	130	130	130

Appendix 13

Bivariate Correlation Between Psychological Trauma and Sleep Quality SPSS Output

Correlations

		Zscore (ITQ_GLOBAL)	Zscore (PSQI_GLOBAL)
Zscore(ITQ_GLOBAL)	Pearson Correlation	1	.533**
	Sig. (2-tailed)		<.001
	N	130	130
Zscore(PSQI_GLOBAL)	Pearson Correlation	.533**	1
	Sig. (2-tailed)	<.001	
	N	130	130

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix 14

ANOVA Table and Model Summary (R^2 and F-Test)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6464.269	3	2154.756	18.418	<.001[b]
	Residual	14740.624	126	116.989		
	Total	21204.892	129			

a. Dependent Variable: PRMQ_GLOBAL

b. Predictors: (Constant), Zscore(MCQ_GLOBAL), Zscore(PSQI_GLOBAL), Zscore (ITQ_GLOBAL)

Model Summary[b]

					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.552[a]	.305	.288	10.816	.305	18.418	3	126	<.001	1.941

a. Predictors: (Constant), Zscore(MCQ_GLOBAL), Zscore(PSQI_GLOBAL), Zscore(ITQ_GLOBAL)

b. Dependent Variable: PRMQ_GLOBAL

Appendix 15

Regression Coefficients Table: Predictors of memory Performance SPSS Output

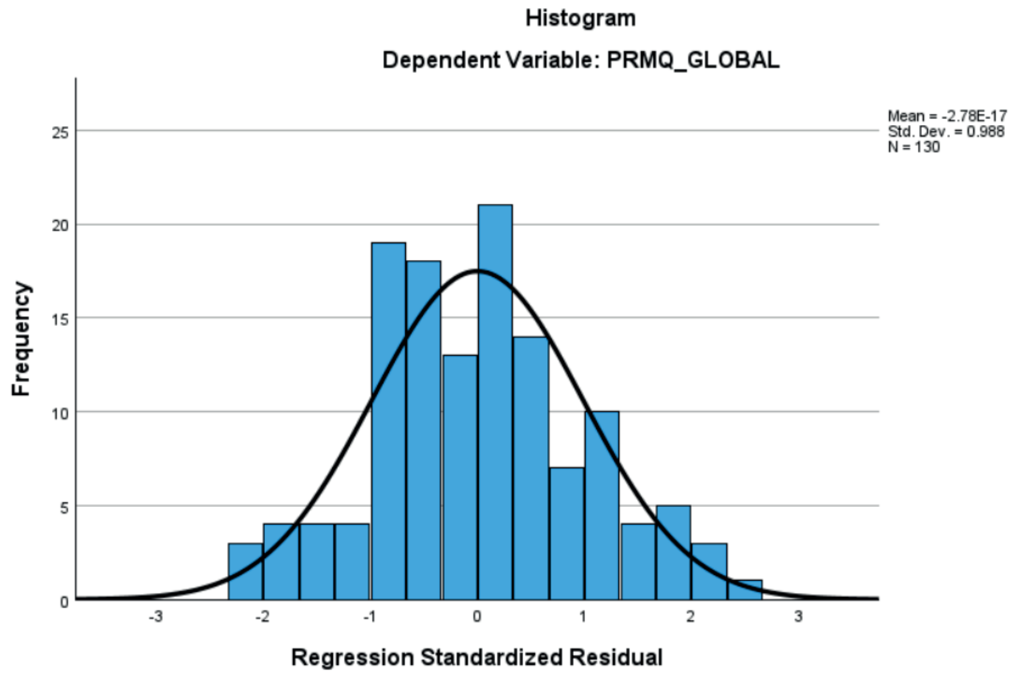
Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	42.092	.949		44.371	<.001	40.215	43.970					
	Zscore(ITQ_GLOBAL)	1.080	1.453	.084	.744	.458	-1.795	3.955	.451	.066	.055	.430	2.327
	Zscore(PSQI_GLOBAL)	2.583	1.127	.201	2.291	.024	.352	4.814	.370	.200	.170	.714	1.401
	Zscore(MCQ_GLOBAL)	4.890	1.300	.381	3.762	<.001	2.318	7.463	.504	.318	.279	.537	1.863

a. Dependent Variable: PRMQ_GLOBAL

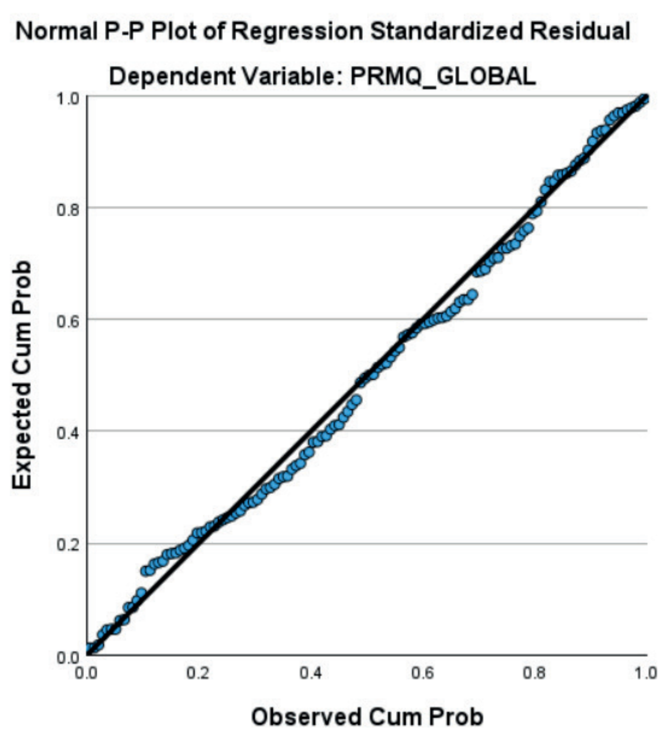
Appendix 16

Histogram of Residuals for Normality Check SPSS Output



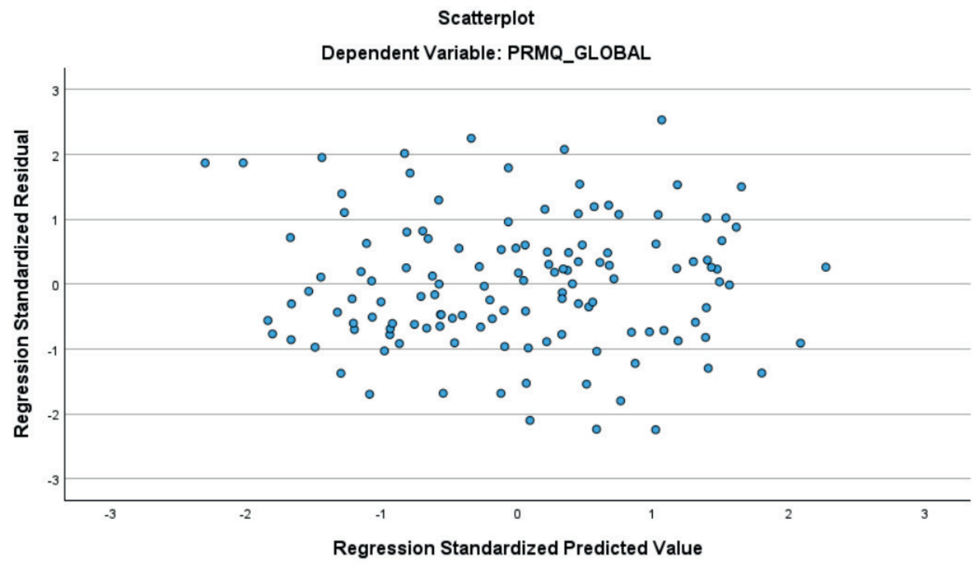
Appendix 17

Normal P-P Plot of Regression Standardized Residuals SPSS Output



Appendix 18

Scatterplot of Standardized Residuals for Homoscedasticity and Linearity SPSS Output



Appendix 19

Collinearity Diagnostics (VIF and Tolerance) SPSS Ouput

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Zscore (ITQ_GLOBAL)	Zscore (PSQI_GLOBAL)	Zscore (MCQ_GLOBAL)
1	1	2.038	1.000	.00	.09	.09	.09
	2	1.000	1.428	1.00	.00	.00	.00
	3	.688	1.721	.00	.01	.68	.26
	4	.274	2.726	.00	.90	.23	.65

a. Dependent Variable: PRMQ_GLOBAL

Appendix 20

Residuals Statistics and Cook's Distance Value SPSS Output

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	25.80	58.17	42.09	7.079	130
Residual	-24.297	27.385	.000	10.690	130
Std. Predicted Value	-2.302	2.272	.000	1.000	130
Std. Residual	-2.246	2.532	.000	.988	130

a. Dependent Variable: PRMQ_GLOBAL