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**MSc in Psychology, Neuroscience and Human Sciences**



**The Relationship of Media Multitasking and Social Media  
Use  
with Attention and Executive Functions in Adults:  
A Scoping Review**

*How are media multitasking and social media use related to attention and executive functions in adults, and what patterns emerge from the existing literature?*

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|                                                                                                  |    |
|--------------------------------------------------------------------------------------------------|----|
| ABSTRACT .....                                                                                   | 3  |
| CHAPTER 1 .....                                                                                  | 4  |
| 1.1 The Digital Attention Economy: How Modern Media Environments Shape Cognitive Engagement..... | 5  |
| 1.2 Scope and Organization of This Chapter .....                                                 | 8  |
| 1.3 The Cognitive Architecture of Attention .....                                                | 9  |
| 1.3.1 Sustained Attention and Vigilance .....                                                    | 9  |
| 1.3.2 Selective Attention and Attentional Control .....                                          | 10 |
| 1.3.3 Mind Wandering as a Marker of Attentional Failure .....                                    | 11 |
| 1.4 Executive Functions: Diamond's Tripartite Framework .....                                    | 13 |
| 1.4.1 Inhibitory Control.....                                                                    | 13 |
| 1.4.2 Working Memory.....                                                                        | 14 |
| 1.4.3 Cognitive Flexibility .....                                                                | 15 |
| 1.4.4 The Unity and Diversity of Executive Functions .....                                       | 16 |
| 1.5 Theoretical Frameworks in Media Multitasking Research .....                                  | 17 |
| 1.5.1 The Attentional Depletion Hypothesis .....                                                 | 17 |
| 1.5.2 The Scattered Attention Hypothesis .....                                                   | 18 |
| 1.5.3 The Trained Attention Hypothesis.....                                                      | 19 |
| 1.5.4 Why Findings Are Inconsistent: A Conceptual Map .....                                      | 21 |
| 1.5.5 Media Multitasking as Affect Regulation: The Well-Being Dimension.....                     | 22 |
| 1.6 Rationale for a Scoping Review and Research Questions.....                                   | 25 |
| 1.6.1 Why a Scoping Review Rather Than a Meta-Analysis .....                                     | 26 |
| 1.6.2 Patterns in the Literature That Shaped the Research Questions.....                         | 27 |
| 1.6.3 Research Questions.....                                                                    | 29 |
| CHAPTER 2 .....                                                                                  | 30 |
| 2.1 Study Design and Methodological Rationale.....                                               | 31 |
| 2.2 PCC Framework .....                                                                          | 32 |
| Population .....                                                                                 | 32 |
| Concept.....                                                                                     | 33 |
| Context.....                                                                                     | 34 |
| 2.3 Search Strategy.....                                                                         | 34 |
| 2.4 Eligibility Criteria .....                                                                   | 36 |
| Inclusion Criteria .....                                                                         | 36 |
| Exclusion Criteria.....                                                                          | 36 |
| 2.5 Screening Process .....                                                                      | 37 |

|                                                                   |    |
|-------------------------------------------------------------------|----|
| 2.6 Data Extraction.....                                          | 38 |
| 2.7 Data Synthesis.....                                           | 39 |
| 2.8 Methodological Limitations of the Review Process .....        | 40 |
| CHAPTER 3 .....                                                   | 42 |
| 3.1 Overview of Included Studies .....                            | 43 |
| 3.2 Theme 1: Media Multitasking and Sustained Attention .....     | 45 |
| 3.2.1 Evidence from Self-Report Measures .....                    | 45 |
| 3.2.2 Evidence from Performance-Based Measures.....               | 46 |
| 3.2.3 Evidence on Content Format .....                            | 47 |
| 3.3 Theme 2: Media Multitasking and Core Executive Functions..... | 48 |
| 3.3.1 Predominantly Null Findings Across Executive Domains.....   | 48 |
| 3.3.2 Partial and Non-Linear Effects.....                         | 49 |
| 3.4 Theme 3: Social Media Use and Executive Functions.....        | 49 |
| 3.4.1 Problematic Use as the More Consistent Predictor .....      | 50 |
| 3.4.2 Specificity and Boundary Conditions.....                    | 50 |
| 3.5 Theme 4: Neurobiological Correlates.....                      | 51 |
| 3.5.1 Dissociations Between Neural and Behavioral Measures.....   | 51 |
| 3.5.2 Evidence for Neural Change Following Use .....              | 52 |
| 3.6 Summary of Findings Across Themes .....                       | 53 |
| CHAPTER 4 .....                                                   | 57 |
| 4.1 Principal Finding: A Domain-Specific Pattern .....            | 58 |
| 4.2 Evaluation of the Three Hypotheses.....                       | 59 |
| 4.2.1 The Attentional Depletion Hypothesis.....                   | 59 |
| 4.2.2 The Scattered Attention Hypothesis .....                    | 60 |
| 4.2.3 The Trained Attention Hypothesis.....                       | 61 |
| 4.3 Cross-Cutting Methodological Patterns.....                    | 62 |
| 4.3.1 Self-Report and Performance-Based Measures.....             | 62 |
| 4.3.2 General Use and Problematic Use.....                        | 63 |
| 4.4 A Non-Linear Finding .....                                    | 64 |
| 4.5 Limitations .....                                             | 65 |
| 4.5.1 Limitations of the Review Process .....                     | 65 |
| 4.5.2 Limitations of the Included Evidence .....                  | 65 |
| 4.5.3 Conceptual and Measurement Limitations .....                | 66 |
| 4.6 Implications and Directions for Future Research.....          | 67 |
| CHAPTER 5 .....                                                   | 68 |

|                                                                |     |
|----------------------------------------------------------------|-----|
| 5.1 Answering the Research Questions.....                      | 69  |
| Main Research Question .....                                   | 69  |
| Sub-Question 1: Sample Characteristics.....                    | 69  |
| Sub-Question 2: Consistency Across Cognitive Domains .....     | 69  |
| Sub-Question 3: General and Problematic Social Media Use ..... | 70  |
| 5.2 Contribution of the Review .....                           | 70  |
| 5.3 Concluding Remarks .....                                   | 71  |
| REFERENCES .....                                               | 72  |
| APPENDIX A .....                                               | 80  |
| APPENDIX B .....                                               | 103 |
| APPENDIX C .....                                               | 106 |

## **ABSTRACT**

Concern that habitual media multitasking and social media use are eroding adult cognition has become widespread, yet the empirical literature underlying that concern is notably mixed. This scoping review, conducted in accordance with the PRISMA-ScR framework and JBI methodology, maps the available evidence on how media multitasking and social media use relate to attention and executive functions in adults, and asks whether the apparent inconsistency of the literature conceals an interpretable structure. A systematic search of Scopus and PubMed, supplemented by hand searching, yielded 1,247 records, of which 28 empirical studies met the inclusion criteria after screening in Rayyan. Studies were synthesized narratively around four thematic clusters: media multitasking and sustained attention, media multitasking and core executive functions, social media use and executive functions, and neurobiological correlates.

Three findings organize the results. First, the evidence points to a domain-specific pattern: media multitasking was associated with sustained attention difficulty with reasonable consistency, but showed little reliable association with core executive functions, a pattern visible both across studies and within a single experiment. Second, the direction of findings depended heavily on measurement: associations observed in self-report measures were not consistently reproduced in objective performance tasks, pointing to shared method variance as a partial explanation for the field's apparent consensus. Third, associations between social media use and executive difficulty emerged mainly when engagement was operationalized as problematic use rather than general frequency. Evaluated against the depletion, scattered attention, and trained attention hypotheses, no single account explained the full pattern; the evidence was more consistent with a domain-specific interpretation in which media multitasking relates to sustained attention while largely sparing executive control. These findings suggest that the popular narrative of broad cognitive erosion overstates the case. Because the evidence base draws heavily on young adult and university samples, these conclusions apply most securely to that population rather than to the adult lifespan as a whole, and future research should prioritize longitudinal designs, objective measurement, more diverse samples, and the distinction between ordinary and problematic use.

**Keywords:** media multitasking, social media use, sustained attention, executive functions, problematic social media use, scoping review, attention

## CHAPTER 1

### INTRODUCTION

#### 1.1 The Digital Attention Economy: How Modern Media Environments Shape Cognitive Engagement

Across the past fifteen years, the environments in which adults encounter, process, and respond to information have been fundamentally restructured. The widespread adoption of smartphones, the maturation of social media platforms, and the architectural logic of algorithmic content delivery have collectively produced what scholars in communication science and cognitive psychology have begun to term the digital attention economy, an ecosystem in which human attentional resources are systematically targeted, competed for, and monetized (Drody et al., 2025). Understanding the cognitive consequences of sustained participation in this ecosystem is no longer a peripheral concern of media studies; it has become a central empirical question for cognitive psychology and neuroscience.

Adult engagement with digital media is substantial and continues to grow. Social media use is now widespread among adults and adolescents in high-income countries, although prevalence estimates vary by age group, survey methodology, and how regularly use is defined (Aitken et al., 2025). In practice, this engagement is rarely singular or sequential. Contemporary digital media use is characterized by simultaneity: users scroll through social media feeds while listening to music, check messaging applications during work tasks, and consume video content while monitoring other screens. This pattern, the concurrent or rapidly alternating engagement with two or more media streams, constitutes what Ophir, Nass, and

Wagner (2009) formalized as media multitasking, and it has become one of the defining behavioral signatures of adult life in digitally saturated environments.

What distinguishes the current media environment from earlier periods of multi-channel media consumption is not merely the quantity of available content, but the intentional design of platforms to sustain and recapture attention. Social media platforms such as TikTok, Instagram, Facebook, and Twitter/X operate through algorithmic recommendation systems, variable reward schedules, and interface affordances (infinite scrolling, autoplay, notification badges) that are specifically engineered to minimize disengagement and maximize dwell time (Su et al., 2021; Drody et al., 2025). These design features do not merely respond to existing attentional preferences; accumulating evidence suggests they may actively shape attentional tendencies over time. Whether and how this reshaping occurs at the level of specific cognitive systems is the central empirical question motivating this review.

A critical distinction in the empirical literature between general social media use, characterized by frequency, duration, and platform diversity, and what researchers have termed problematic social media use (PSMU). PSMU refers to a pattern of engagement exhibiting features associated with behavioral addiction: salience, tolerance, mood modification, conflict, and withdrawal (Andreassen et al., 2012). While general use and PSMU are correlated, they are not equivalent constructs, and their cognitive correlates appear to differ substantially. Studies operationalizing social media engagement as PSMU, typically via validated instruments such as the Bergen Social Media Addiction Scale (BSMAS; Andreassen et al., 2016), consistently report associations with executive function deficits, whereas studies measuring general usage frequency often do not (Reed, 2023; Golding et al., 2025; Kahya et al., 2025; Shannon et al., 2025). This divergence is one of the most consequential patterns in the current literature and this review examines it systematically.

Media multitasking is not new (people have always engaged in some degree of concurrent activity), but its current form differs from historical precedents in at least three respects. First, the cognitive demands of modern media streams are high: social media content, short-form video, and interactive messaging applications all require active visual processing, semantic interpretation, and response generation, unlike the more passive co-consumption of, for example, radio and background music that earlier generations practiced. Second, the frequency and granularity of task-switching have increased dramatically: contemporary media multitasking often involves switching between streams in intervals of seconds rather than minutes, placing different demands on cognitive control systems than the longer-form alternation studied in earlier dual-task research. Third, the social and motivational salience of digital media (interruptions, notifications, social feedback signals, and algorithmically timed content reveals) creates an attentional pull that differs fundamentally from the endogenous task-switching examined in laboratory switching paradigms (Drody et al., 2025; Wang & Chen, 2026).

These structural features of the modern media environment have motivated a substantial program of empirical research. Beginning with Ophir et al.'s (2009) foundational comparison of heavy and light media multitaskers on cognitive control tasks, the literature has expanded to encompass cross-sectional surveys, laboratory experiments, longitudinal studies, and neuroimaging investigations employing fMRI, EEG, and fNIRS. The body of research is now large enough to support systematic synthesis but also heterogeneous enough that simple generalizations are difficult to sustain. Studies using different operationalizations of media use, outcome measures, participant populations, and analytical approaches have produced a landscape of partially converging and partially conflicting findings that resists easy summary.

The present scoping review takes this heterogeneity seriously. Rather than minimizing it in service of a single summary conclusion, the review treats variability in findings as informative. Where findings converge across different methodological approaches, that convergence provides stronger grounds for inference. Where they diverge, the nature and patterning of the divergence (across cognitive domains, participant populations, and operationalizations of media use) is treated as evidence about the structure of the phenomenon itself. This approach reflects the epistemological commitments of scoping review methodology (Tricco et al., 2018; Peters et al., 2020): the goal is to map what is known, identify where it is most and least consistent, and surface the conceptual and methodological questions that future research will need to address.

## **1.2 Scope and Organization of This Chapter**

Chapter 1 provides the theoretical and conceptual foundation for the review. Following this introductory section, Section 1.3 presents the cognitive architecture of attention, drawing on established frameworks to delineate the specific attentional components, sustained attention, selective attention, and attentional control, that are most directly implicated in the media multitasking literature. Section 1.4 presents the tripartite model of executive functions (Diamond, 2013), which provides the organizing framework for the review's treatment of inhibitory control, working memory, and cognitive flexibility. Section 1.5 situates the review within the broader theoretical landscape of media effects research, including the dominant hypotheses that have guided empirical work in this area.

Section 1.6 specifies the research questions that structure the review and the rationale for their formulation.

Across all sections of this chapter, the aim is not to prejudge the empirical literature but to establish the conceptual vocabulary and theoretical context needed to interpret it rigorously. Whether, and how, habitual media multitasking alters attentional and executive function capacities in adults remains genuinely open. The theoretical frameworks presented here do not determine the answer; they provide the scaffolding for coherently evaluating the evidence.

## **1.3 The Cognitive Architecture of Attention**

Attention is not a unitary construct but a family of interrelated processes that determine how the brain selects, prioritizes, and sustains information processing. Any investigation of how media multitasking and social media use shape cognition must first define what attention means and how researchers have operationalized its components. The sections that follow outline three core dimensions: sustained attention and vigilance, selective attention and attentional control, and mind wandering as a marker of attentional failure.

### ***1.3.1 Sustained Attention and Vigilance***

Sustained attention, often used interchangeably with vigilance, refers to the capacity to maintain a focused and alert state over extended periods (Fortenbaugh et al., 2017). The vigilance decrement, a progressive decline in detection accuracy over time, reflects the effortful nature of this process and has been replicated across a wide range of tasks and populations (Esterman & Rothlein, 2019). Sustained attention is commonly assessed using the Sustained Attention to Response Task (SART; Robertson et al., 1997), in which participants respond to frequent non-target digits and withhold responses to a rare target; performance is indexed by commission and omission error rates as well as reaction time variability (Shin et al., 2024). A more recent alternative is the gradual-onset continuous performance task (gradCPT; Rosenberg et al., 2013), which uses gradual transitions between images to minimize transient pop-out effects and provides a cleaner measure of attentional fluctuation. Commission error rate and reaction time variability on the gradCPT have been validated as reliable markers of trait-level sustained attention, and correlate with neural indices of attentional lapsing (Madore et al., 2020). In their large-scale self-report study, Ralph et al. (2014) observed that heavier media multitasking was associated with more frequent everyday attentional failures, though the relationship was less consistent when behavioral task performance was the criterion. Drody et al. (2025) extended this picture by showing that increases in media multitasking over a sustained attention task closely resemble the classical vigilance decrement, and that raising participants' motivation attenuated both the drift into multitasking and the accompanying performance decline.

### *1.3.2 Selective Attention and Attentional Control*

Selective attention (the ability to focus processing on relevant information while suppressing irrelevant input) is closely tied to the top-down regulation of attention described by Posner and Petersen's (1990) Attention Network Theory. This framework distinguishes three functionally distinct networks: alerting, orienting, and executive control, each assessable via the Attention Network Task (ANT; Fan et al., 2002). Despite its theoretical appeal, the ANT has not reliably detected differences between heavy and light media multitaskers: Minear et al. (2013) found no significant group differences on any of the three networks, a pattern that contrasts with results from flanker and filtering paradigms where heavy media multitaskers have sometimes shown reduced capacity to ignore distractors (Ophir et al., 2009; Gorman & Green, 2016). One interpretation is that the brief, high-arousal structure of the ANT may not capture deficits that emerge only under sustained or naturalistic conditions. Evidence on attention switching has been equally inconclusive: some studies report higher switch costs in heavy media multitaskers, whereas others, including Elbe et al. (2019), find smaller switch costs, suggesting a possible training benefit. These contradictions likely reflect that media multitasking is neither a uniform behavior nor a uniform cognitive exposure, and that different engagement patterns may selectively impair or improve different aspects of attentional control. This heterogeneity in selective attention research motivates Sub-Question 2 of this review, which asks whether the evidence looks meaningfully different when sustained attention and executive-level attentional control are examined separately.

### *1.3.3 Mind Wandering as a Marker of Attentional Failure*

Mind wandering, the decoupling of attention from an external task in favor of internally generated thought, has become a widely used index of attentional failure in the

sustained attention literature (Smallwood & Schooler, 2006). It is better understood as a dynamic competition between task-relevant and task-unrelated mental content than as a simple absence of effort (Smallwood & Schooler, 2015), and its occurrence within performance tasks is reliably associated with elevated reaction time variability and increased error rates. Cheyne et al. (2009) proposed a three-state model in which attentional lapses progress from meta-aware off-task thinking to full disengagement without awareness of the departure. Applying this framework to media multitasking, Shin et al. (2024) found that heavier media multitaskers were more likely to mind wander without awareness (a more advanced form of attentional disengagement) rather than simply being more distractible. This distinction matters: it suggests that the attentional costs of heavy media use may manifest as reduced metacognitive monitoring rather than heightened sensory sensitivity to external interruptions. Converging evidence comes from Madore et al. (2020), whose electrophysiological and pupillometric data showed that heavier media multitasking was associated with a greater propensity for pre-stimulus attention lapses, and that commission error rate on the gradCPT partially mediated the relationship between media multitasking and subsequent memory failure. Earlier work by Ralph et al. (2014) had already established associations between media multitasking frequency and both spontaneous and deliberate mind wandering in everyday settings, independent of self-reported memory failures. Across these studies, mind wandering emerges as a construct particularly sensitive to the attentional costs of media multitasking and one that links sustained attention performance to broader consequences for learning and memory.

## 1.4 Executive Functions: Diamond's Tripartite Framework

Executive functions are a family of top-down mental processes that enable goal-directed behavior, self-regulation, and adaptive responses to novel situations (Diamond, 2013). Unlike automatic lower-level operations, they require effortful engagement and draw on prefrontal networks. Diamond's tripartite model identifies three core components, inhibitory control, working memory, and cognitive flexibility, which together underpin reasoning, planning, and complex problem-solving (Diamond, 2013).

### 1.4.1 *Inhibitory Control*

Inhibitory control refers to the capacity to deliberately override prepotent impulses, habitual responses, or distracting information in the service of a current goal (Diamond, 2013). The construct encompasses two related but distinct subtypes. Response inhibition (suppressing a dominant motor response) is typically assessed with Go/No-Go tasks, where commission errors on no-go trials serve as the primary outcome (Murphy et al., 2017; Seddon et al., 2018). Interference control, the resistance to task-irrelevant semantic or perceptual information, is most commonly measured with the Stroop task, which requires participants to name the ink color of incongruent color words and thereby suppress the prepotent reading response (Reed, 2023). The picture that emerges from the media multitasking literature is one of inconsistency. Murphy et al. (2017) observed no significant group differences between heavy and light media multitaskers on either the flanker or Go/No-Go task, though average media multitaskers unexpectedly performed worse than both extremes. A similar null pattern characterized Seddon et al.'s (2018) comprehensive battery, which included multiple

measures of attentional and response inhibition. In contrast, the inhibitory control profile shifts when the focus moves to problematic social media use: Reed (2023) demonstrated an association between social media addiction and impaired impulse control, particularly pronounced when task stimuli were socially relevant, while Shannon et al. (2025) identified attentional impulsivity, rather than behavioral inhibition per se, as the dimension of inhibitory control most reliably elevated in high-PSMU individuals. This pattern suggests that the relationship between media use and inhibitory control is not simply present or absent but depends substantially on how both constructs are defined and operationalized.

#### *1.4.2 Working Memory*

Working memory refers to the capacity to temporarily hold and manipulate information to support ongoing cognitive goals (Baddeley, 2012; Diamond, 2013). Within Baddeley's influential model, a central executive coordinates attentional resources between subsidiary storage systems (the phonological loop and the visuospatial sketchpad) while managing the updating and replacement of information as task demands shift. This updating function is capacity-limited, and this constraint makes working memory a plausible candidate for disruption by media environments that demand constant information management across streams. Laboratory measures of working memory span a range of demands: the N-back task engages continuous monitoring and updating, while the backward digit span and backward Corsi block tasks emphasize active manipulation of stored material (Seddon et al., 2018). Evidence across studies is divided. Müller et al. (2021) reported reduced working memory performance in heavy media multitaskers relative to light media multitaskers on a digit span backwards measure, consistent with the hypothesis that habitual divided attention may

compromise updating capacity. By contrast, Seddon et al. (2018) found no significant relationship between self-reported media multitasking frequency and performance on either backwards digit span or backwards Corsi block tasks in a well-powered sample of young adults. Whether this divergence reflects genuine sample-level differences, task sensitivity, or the limitations of self-report as a proxy for actual media behavior remains an open question, and one that directly affects how working memory findings should be interpreted in this review.

### *1.4.3 Cognitive Flexibility*

Cognitive flexibility refers to the ability to adapt thinking and behaviour to changing task demands, requiring suppression of a previously active mental set and activation of a new one (Diamond, 2013). At the behavioral level, flexibility is operationalized through task-switching paradigms, where the switch cost, the difference in reaction time or accuracy between switch and repeat trials, indexes the efficiency of mental set reconfiguration (Miyake et al., 2000). The Trail Making Test Part B, which requires participants to alternate between numerical and alphabetical sequences, captures flexibility demands in a more ecologically familiar format and is sensitive to a range of clinical conditions affecting prefrontal function. Neither Seddon et al. (2018) nor Müller et al. (2021) found significant associations between media multitasking and cognitive flexibility indices (a null pattern that holds across different flexibility measures, including the Trail Making Test, the Wisconsin Card Sorting Test, and verbal fluency tasks. This consistency of null results across well-designed studies is itself informative: it raises the possibility that cognitive flexibility, as currently operationalized, is not a primary target of media multitasking effects, or alternatively that compensatory

mechanisms, such as those suggested by the trained attention hypothesis,, are particularly active for this component.

#### *1.4.4 The Unity and Diversity of Executive Functions*

A foundational contribution from the cognitive neuroscience literature is the finding that executive functions are simultaneously correlated and separable. Using latent variable analysis, Miyake et al. (2000) demonstrated that inhibition, updating, and shifting share a common factor while also possessing domain-specific variance, a unity-and-diversity structure that has been replicated in multiple independent samples. For the media multitasking literature, this framework has a specific implication: genuinely executive effects should show some cross-domain generalization, whereas domain-specific findings are more consistent with targeted disruption of particular processes. The mixed pattern that characterizes the current evidence, where media multitasking sometimes relates to inhibitory control or working memory, but rarely to both simultaneously, and rarely to flexibility at all (maps onto the diversity side of this framework more than the unity side. Shannon et al. (2025) added a further nuance by identifying attentional impulsivity as the inhibitory dimension most reliably linked to problematic social media use, while Müller et al. (2021) observed that working memory differences did not generalize to other executive measures in the same sample. Rather than resolving the question, this pattern deepens it: the divergence within the executive function domain, not just between executive functions and sustained attention, deserves systematic documentation) which is one of the contributions this review aims to make.

## 1.5 Theoretical Frameworks in Media Multitasking Research

The growth of empirical research on media multitasking has been accompanied by competing theoretical accounts of what habitual media multitasking does, or does not do, to cognitive functioning. Three principal hypotheses have shaped the field: the attentional depletion hypothesis, the scattered attention hypothesis, and the trained attention hypothesis. These frameworks are not mutually exclusive, and understanding how they interact helps explain the varied results in the empirical literature.

### *1.5.1 The Attentional Depletion Hypothesis*

The attentional depletion hypothesis proposes that frequent, concurrent engagement with multiple media streams gradually erodes the internal resources required for endogenous attentional control. This view holds that because media multitasking demands constant shifts in focus and the continuous processing of competing information, it places sustained demands on the executive system. Over time, this chronic cognitive load is hypothesized to weaken the top-down mechanisms necessary for sustaining focus, leaving individuals increasingly dependent on external stimuli to direct their attention rather than relying on internal goal states. Early support for this framework came from Ralph et al. (2014), who demonstrated that heavier media multitasking was associated with greater self-reported attentional failures and more frequent mind wandering in everyday life. More recently, Mahakud and Thapliyal (2026) extended this logic experimentally by showing that exposure

to sludge media content, a format characterized by multiple simultaneous video streams, produced a significant decline in sustained attention performance relative to both a standard short-video condition and a no-media control. These findings are consistent with the view that media environments engineered for high stimulation may progressively deplete the attentional resources needed for focused, sustained engagement.

### *1.5.2 The Scattered Attention Hypothesis*

The scattered attention hypothesis, originating from the foundational work of Ophir et al. (2009), offers a complementary but distinct account. Rather than proposing a generalized depletion of resources, this hypothesis holds that heavy media multitaskers develop a broader attentional set, characterized by an increased tendency to process task-irrelevant information. Heavy media multitaskers are not simply less capable of attending; rather, their attentional filter operates with a wider aperture, allowing both relevant and irrelevant stimuli to compete for processing resources. Ophir et al. (2009) showed that heavy media multitaskers were outperformed by light media multitaskers on tasks requiring filtering irrelevant distractors and suppressing task-irrelevant representations in working memory. Kobayashi et al. (2020) extended this account to the neural level, finding that heavy media multitaskers showed altered functional connectivity in the dorsal attention network: degree centrality during an oddball task failed to decrease from resting-state levels in the way observed for light media multitaskers, suggesting that the network did not reconfigure appropriately for task demands. This neural evidence is consistent with a qualitative shift in how attentional resources are organized and deployed, rather than simply a reduction in overall capacity.

### *1.5.3 The Trained Attention Hypothesis*

In direct contrast to the depletion and scattered attention accounts, the trained attention hypothesis, which proposes that the frequent practice of task-switching and information management inherent in media multitasking may enhance certain cognitive capacities. Individuals who regularly navigate high-interference media environments are, in effect, practicing the rapid reallocation of attentional resources: a pattern that could theoretically improve cognitive flexibility and the efficiency of switching between diverse information streams (Kobayashi et al., 2020). Indirect support for this perspective comes from Zhang et al. (2022), whose event-related potential study showed that heavy and light media multitaskers achieved comparable accuracy on a prospective memory task but did so through qualitatively different neurocognitive strategies: heavy media multitaskers recruited greater monitoring resources during the task, while light media multitaskers relied more on spontaneous cue detection. Rather than indicating impairment, this finding suggests that heavy media multitaskers may have developed compensatory attentional strategies that maintain performance through a more resource-intensive route. The trained attention hypothesis thus positions media multitasking not as uniformly harmful but as potentially reshaping the attentional system in ways that carry both costs and benefits depending on the demands of the task at hand.

The trained attention hypothesis rests on a simple assumption: the brain adapts to repeated experience. Attention systems are not fixed; demands reshape them. From this perspective, a person who is chronically exposed to fast, frequent switching between media streams may develop an attentional system tuned to that kind of environment. The point is not that media multitasking “damages” attention, but that attention recalibrates itself to a particular environmental demand.

One way this recalibration has been described is as a shift toward breadth-biased attention. An individual who has to keep track of multiple streams of information, rather than narrowing attention onto a single target, may become accustomed to scanning a wide range of stimuli in the environment. Ophir et al. (2009) proposed that heavy media multitaskers show exactly this profile: weaker at filtering out irrelevant stimuli, but more inclined to spread their attention across a broad field. This tendency also fits the exploitation-exploration model of media multitasking proposed by Wiradhany, Baumgartner, and de Bruin (2021), which suggests that heavy media multitaskers may be more likely to search for new and potentially more rewarding stimuli than to maintain focus on the current task. The attentional system, in effect, drifts toward a state that is ready to scan for the next stimulus.

This mechanism may help explain why media multitasking is more consistently related to sustained attention than to core executive functions. Sustained attention requires holding focus on a single target over a long period, precisely the kind of task that a broad-scanning attentional system would struggle with. In contrast, tasks that demand rapid, externally driven switching may benefit from this adaptation. Some of the studies in this review are consistent with this pattern. Colvett et al. (2025) found that heavy media multitaskers showed lower switch costs on externally cued task switching, and Zhang et al. (2022) found that heavy and light media multitaskers reached comparable performance through different neural strategies, with the heavy group recruiting greater monitoring resources. Together, these findings suggest that the trained attention hypothesis should be read not as a general cognitive advantage, but as a narrow, environment-specific form of adaptation or compensation.

#### *1.5.4 Why Findings Are Inconsistent: A Conceptual Map*

The coexistence of these three theoretical accounts reflects a deeper problem in the literature: the persistent inconsistency of empirical findings across studies. Several contributing factors become visible when the evidence is mapped systematically. Sample characteristics play a decisive role, Rioja et al. (2023) demonstrated across three recruitment platforms that the correlation between media multitasking and sustained attention varied substantially depending on where participants were recruited, even when measures were held constant. This implies that population-level differences in baseline attentional capacity, media use patterns, or demographic composition can substantially inflate or suppress observed effect sizes, making it difficult to generalize from any single study.

Measurement limitations compound this problem. The dominant instrument in this literature, the Media Multitasking Index (MMI; Ophir et al., 2009), relies on retrospective self-report and does not objectively verify actual media behavior. In a large-scale study, Wiradhany et al. (2020) found that heavier MMI scorers reported more attentional failures in daily life but did not perform significantly worse on laboratory measures of distractibility or mind wandering. A self-report versus performance gap suggesting the MMI may partly capture perceived distractibility or personality tendencies rather than a stable cognitive deficit. Network analytic work by Fisher et al. (2023) reinforced this concern by demonstrating that media multitasking is not a unitary behavior but a cluster of related but distinct engagement patterns, each with different relationships to attentional outcomes.

Motivational and contextual factors add a further layer of moderation. Drody et al. (2025) showed that performance decrements associated with increasing media multitasking over the course of a task were substantially attenuated when participants received motivating

instructions, suggesting that the cognitive costs of heavy media use are not fixed properties of the individual but depend on the value assigned to the primary task in the moment. Together, these sources of variability (sampling composition, measurement approach, and motivational context) constitute a coherent account of why a literature spanning more than fifteen years has not converged on a definitive conclusion. Mapping this complexity systematically, with sufficient methodological detail to understand where and why results diverge, is precisely what a scoping review is designed to do.

#### *1.5.5 Media Multitasking as Affect Regulation: The Well-Being Dimension*

The sections considered so far have focused on the cognitive costs of media multitasking, such as distraction and difficulty sustaining attention. This raises a fundamental question: if media multitasking is so cognitively costly, why do people continue to engage in it, and even increase it? Laboratory research has consistently shown that multitasking impairs performance, yet the behaviour has become increasingly widespread. This apparent paradox suggests that media multitasking is not merely a cognitive phenomenon, but a behaviour that also serves an affective function.

One way to explain this paradox is to view media multitasking as an affect-regulation mechanism. Using data collected from university students over four weeks, Wang and Tchernev (2012) found that people engage in media multitasking to satisfy cognitive needs, such as information seeking and efficiency, but these cognitive needs are not actually satisfied. In contrast, they obtain emotional gratification even though they do not actively seek it. In other words, multitasking is cognitively inefficient but emotionally rewarding. This

emotional reward becomes an implicit yet powerful driver of the behaviour, placing it in a self-reinforcing loop.

People do not multitask with media purely for the cognitive rewards, and the emotional pull takes several concrete forms. There is the urge to escape a boring or unpleasant task by reaching for the phone; the quick boost of checking a feed; and the sense of being connected to others, which becomes especially strong in moments of loneliness or anxiety. This is a well-known idea in communication research: people use media not only for information but also to manage feelings. The Uses and Gratifications tradition and Zillmann's Mood Management Theory both point in this direction, describing people as choosing media partly in order to regulate mood and move away from negative states (Katz et al., 1973; Zillmann, 1988).

This view is consistent with one of the central patterns of the present review: associations with attention and executive functions emerged more consistently when both media use and cognitive difficulty were self-reported, a situation in which the emotional experience of media use is likely to play a larger role. A useful way to think about the mechanism is opportunity cost. Staying with a task becomes less appealing the longer it goes on, particularly when the task is dull or demanding, and the alternatives, a message, a notification, a video, start to look more attractive. Boredom can be read as the signal of that rising opportunity cost, a nudge to shift attention elsewhere. In the vocabulary of decision-making, the person moves from exploitation, sticking with the present task, to exploration, going after more immediately rewarding stimuli (Wiradhany, Baumgartner, & de Bruin, 2021). Escaping boredom feels real, but it is short-term, and over time the attentional cost shows up.

Attention and affect influence each other in a both directions, and the two tend to feed each other. When attentional control is weak, negative emotions become harder to regulate, and one common response is to reach for media for relief. In the opposite direction, states such as anxiety or low mood make it harder to concentrate and sustain attention in the first place, which invites further distraction. The result can be a loop in which attentional problems and emotional distress reinforce each other. Any account of the cognitive correlates of media multitasking that leaves out the emotional side will therefore be incomplete.

In discussing the psychological consequences of social media and digital technology use, one of the field's most influential methodological contributions is the work of Amy Orben and Andrew Przybylski. Orben and Przybylski (2019a) used a method called specification curve analysis. The purpose of this method is to systematically test all reasonable analytical choices a researcher can make when analysing a dataset, such as which variables to include, which controls to apply, and how the constructs are measured, and to report the results as a single integrated outcome. This offers a solution to the problem of researcher degrees of freedom, in which researchers can unintentionally make small effects appear statistically significant. By analysing three large datasets, with approximately 355,000 participants in total, they found that the association between digital technology use and adolescent well-being was negative but extremely small, explaining at most 0.4% of the variation in well-being. To make this effect size intelligible, Orben compared it with trivial or unexpected factors in everyday life. The negative association between digital technology use and adolescent well-being was comparable to the association of wearing glasses; in some analyses, the association between regularly eating potatoes and well-being was close to that of screen use. These striking comparisons highlight how disproportionate public and political concern about social media and mental health is relative to the effect sizes indicated by the available empirical evidence.

Separately, Orben and Przybylski (2019b) showed that measurement methods partly explain the problem. In time-use-diary measures drawn from three large samples, they found little clear evidence that screen time is associated with lower well-being. They also reported a low correlation between retrospective self-report measures and more objective diary-based measures. This suggests that the self-report-based screen-time measures widely used in the field may not accurately reflect actual use. This finding parallels a pattern observed in this review in the domain of attention and executive functions: self-report measures tend to produce associations that objective performance measures do not confirm.

Orben's contribution highlights two basic methodological lessons. First, interpret small effect sizes carefully and avoid exaggerating them. Second, measurement methods, and in particular an overreliance on self-report, can substantially influence findings. Orben also argues that we should pay more attention to the individual differences that shape how each person responds to digital technology. Although these lessons originate in the well-being literature, they apply directly to the attention and executive function domain this review focuses on. In both fields, the evidence is more measured, smaller, and more complex than the popular narrative suggests; even where associations exist, the available evidence does not sufficiently support causal claims or alarmist interpretations. For this reason, the same methodological caution urged by Orben should be adopted when evaluating the cognitive correlates of media multitasking and social media use.

## **1.6 Rationale for a Scoping Review and Research Questions**

The methodological choice to conduct a scoping review rather than a systematic review with meta-analytic synthesis was not arbitrary. It reflects a judgment about the current state of this literature, one that emerged directly from engaging with the empirical evidence

during preliminary mapping. What follows is an account of that reasoning, and of the specific research questions it generated.

### *1.6.1 Why a Scoping Review Rather Than a Meta-Analysis*

A meta-analysis is only as meaningful as the comparability of the studies it aggregates. Pooling effect sizes across studies that measure fundamentally different constructs, in different populations, with different instruments, produces a number that is arithmetically precise but conceptually hollow. The media multitasking literature, at its current stage of development, does not meet the conditions that would make such aggregation informative.

The heterogeneity runs deep. On the independent variable side, researchers have operationalized media multitasking primarily through the Media Multitasking Index (MMI; Ophir et al., 2009), but the instrument has been used in its original form, in frequency-based variants, and in abbreviated versions, each with different psychometric properties and different sensitivity to the underlying behavior. Social media use, meanwhile, has been measured as daily hours on a platform, as a composite engagement score, and as a clinical-style indicator of problematic use, yielding constructs that share a label but not a meaning. On the outcome side, the range of cognitive measures is equally wide: sustained attention via the SART, the gradCPT, and self-report questionnaires; inhibitory control via Go/No-Go tasks, Stroop tasks, flanker paradigms, and the Iowa Gambling Task; working memory via N-back tasks and digit span; cognitive flexibility via task-switching paradigms and the Trail Making Test. These are not interchangeable proxies for a single latent ability, they each capture something distinct (Seddon et al., 2018; Murphy et al., 2017).

A scoping review is the appropriate response to this kind of evidence landscape. Following the PRISMA Extension for Scoping Reviews (PRISMA-ScR; Tricco et al., 2018) and the methodological framework established by Peters et al. (2020) through the JBI Manual for Evidence Synthesis, the goal of this review is not to estimate a pooled effect but to map the breadth of available evidence to ask what has been studied, how it has been studied, and where the field's conclusions are most and least secure. This is precisely the contribution a scoping review can make that a meta-analysis cannot: it can surface a field's conceptual architecture, including its fault lines.

### *1.6.2 Patterns in the Literature That Shaped the Research Questions*

The three research questions guiding this review did not emerge from prior assumptions about what media multitasking does to cognition. They emerged from three consistent patterns that became visible during preliminary literature mapping, each pointing toward a dimension of the evidence that existing reviews had not examined with sufficient precision.

The first pattern concerned sample characteristics. Rioja et al. (2023) recruited over 900 participants across three platforms, Amazon Mechanical Turk, Prolific, and a university student pool, and found that the correlation between media multitasking and sustained attention varied considerably depending on where participants were recruited, even when measures were held constant. The implication is direct: conclusions drawn from any single study may reflect the composition of its sample as much as the underlying cognitive relationship. Many null results in this literature originate from small undergraduate convenience samples (Seddon et al., 2018; Murphy et al., 2017), and whether that pattern is

methodological noise or a genuine signal about population-level moderation has not been systematically addressed.

The second pattern concerned the cognitive domain under investigation. A striking asymmetry emerged when comparing the sustained attention literature with the executive function literature. Evidence linking heavier media multitasking to sustained attention deficits (increased attentional lapses, more frequent mind wandering, higher variability on performance tasks) has been relatively consistent across independent research groups (Ralph et al., 2014; Rioja et al., 2023; Shin et al., 2024). The evidence linking media multitasking to inhibitory control, working memory, and cognitive flexibility has been considerably less so: Seddon et al. (2018) administered a battery of ten executive function tasks to 112 young adults and found no significant associations with any of them, while Murphy et al. (2017) similarly found no differences on flanker and Go/No-Go paradigms. The possibility that sustained attention and executive functions represent genuinely separable targets of media multitasking, rather than a uniform gradient of cognitive decline, is theoretically important and has not been mapped systematically across the literature.

The third pattern concerned the distinction between general social media use and problematic social media use. Studies operationalizing social media engagement as time spent on platforms have produced inconsistent results with respect to executive function outcomes. Studies using validated addiction-style instruments have been more consistent: Reed (2023) demonstrated that social media addiction was associated with impaired inhibitory control, particularly when task stimuli were socially relevant; Golding et al. (2025) showed that the relationship between TikTok use intensity and executive function impairment was fully mediated by PSMU rather than driven by platform-specific features; Shannon et al. (2025) identified attentional impulsivity as the inhibitory dimension most strongly associated

with problematic use; and Kahya et al. (2025) reported that PSMU was negatively associated with organizational executive functioning in a general adult sample. Collapsing general use and PSMU into a single predictor, as some studies have done, likely obscures this distinction and contributes to the appearance of inconsistency in the broader literature.

### *1.6.3 Research Questions*

Drawing on the methodological rationale and the patterns identified above, this scoping review is guided by the following research questions.

**Main Research Question (MRQ):** What is known from the empirical literature about the relationships of media multitasking and social media use with on attentional control and executive functions in adults, and how have these relationships been conceptualized, measured, and reported across study designs?

**Sub-Question 1 (SQ1):** How have adult samples been characterized across studies, and do attentional and executive function outcomes differ as a function of sampling method, sample size, or demographic composition?

**Sub-Question 2 (SQ2):** What is the nature and consistency of the evidence regarding media multitasking's association with sustained attention compared to its association with inhibitory control, working memory, and cognitive flexibility?

**Sub-Question 3 (SQ3):** How do reported associations with executive functions differ when social media engagement is operationalized as general usage frequency versus as problematic social media use (PSMU), and what neural indicators have been examined?

The analytic thread running through all three sub-questions is the contrast between sustained attention and executive function. Across multiple independent research groups, the cognitive costs of heavy media multitasking appear more consistent and more pronounced for vigilance and attentional stamina than for higher-order executive control processes. Whether this contrast reflects a genuine difference in the vulnerability of these cognitive systems, a methodological artifact of how executive function tasks are designed, or an interaction with how media use is operationalized are precisely the questions this review is positioned to address. Mapping the evidence across these dimensions, with enough methodological detail to understand where and why results diverge, is the core contribution of this scoping review.

## **CHAPTER 2**

### **METHODOLOGY**

#### **2.1 Study Design and Methodological Rationale**

This review was conducted as a scoping review following the methodological framework outlined in the JBI Manual for Evidence Synthesis (Peters et al., 2020) and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews checklist (PRISMA-ScR; Tricco et al., 2018). The decision to adopt this design rather than a systematic review with meta-analytic synthesis reflects a considered judgment about the current state of the literature, one that emerged from preliminary mapping and is elaborated in Chapter 1.

Three interconnected reasons support this choice. First, the existing literature on media multitasking and social media use in relation to attention and executive functions is methodologically heterogeneous in ways that preclude meaningful quantitative aggregation. Studies vary across dimensions that resist pooling: some use laboratory cognitive tasks while others rely entirely on self-report; some operationalize media multitasking through the original MMI while others use frequency-based or abbreviated variants; and dependent variables range from reaction time on sustained attention tasks to neuroimaging indices of functional connectivity. Second, the primary aim of this review is to map the breadth of available evidence rather than to estimate a single effect, documenting what has been studied, how constructs have been measured, and where the field's conclusions are most and least secure. This is the contribution that scoping methodology is designed to make, as articulated by Arksey and O'Malley (2005) and elaborated in the JBI framework (Peters et al., 2020).

Third, the field has grown and diversified substantially since Ophir et al. (2009) first demonstrated cognitive control differences between heavy and light media multitaskers, and a systematic mapping of how the evidence has developed across subdomains, populations, and methodological approaches is a necessary precondition for any future meta-analytic effort.

No formal protocol was registered for this review. The review methods, including the eligibility criteria, search strategy, and thematic synthesis approach, were specified before the final screening and extraction stages were completed, and they are reported transparently in the sections below. The absence of prospective registration is acknowledged as a limitation in Section 2.8.

## **2.2 PCC Framework**

The review was structured using the Population, Concept, and Context (PCC) framework recommended by the JBI methodology for scoping reviews (Peters et al., 2020). Each element was operationalized as follows.

### ***Population***

The population of interest comprised adult or predominantly adult samples. A study was eligible when participants aged 18 years or older constituted the primary population described in the original report. Mixed-age samples were retained when they met this

condition; the inclusion of a small number of participants younger than 18 years was recorded as a limitation of population specificity where applicable. This encompassed university students, young adults recruited through online platforms, and community or general population samples. Three included studies reported age ranges beginning at 17 years (Arness & Ollis, 2023; Shannon et al., 2025; Su et al., 2021); because the original reports did not provide subgroup counts sufficient to isolate these participants, these studies were retained but their age composition is acknowledged in Section 2.8.

### *Concept*

The concept domain encompassed two related but distinguishable independent variables alongside their cognitive correlates. Media multitasking was operationalized as the concurrent or rapidly alternating use of two or more media streams and was measured primarily through the Media Multitasking Index (MMI; Ophir et al., 2009) or one of its variants, including frequency-based adaptations and the shorter Media Multitasking Experience Scale. Social media use was conceptualized along a continuum: general usage frequency, measured through self-reported daily minutes, application logging, or platform-specific intensity scales, was distinguished from problematic social media use (PSMU), which reflects addictive-style engagement characterized by salience, tolerance, mood modification, conflict, and withdrawal, and is typically assessed through instruments such as the Bergen Social Media Addiction Scale or equivalent validated measures. The dependent variables included attention, encompassing sustained attention, selective attention, and attentional control, and executive functions as defined by Diamond's (2013) tripartite model: inhibitory control, working memory, and cognitive flexibility.

## *Context*

No restrictions were placed on research context. The review encompassed laboratory-based experimental studies, cross-sectional surveys, longitudinal designs, experience-sampling protocols, and neuroimaging investigations employing functional magnetic resonance imaging, electroencephalography, or functional near-infrared spectroscopy. This breadth was deliberate: one of the review's aims is to characterize how findings differ across methodological approaches, and restricting context would foreclose precisely the comparisons that make such characterization possible.

## **2.3 Search Strategy**

A systematic search was conducted in June 2026 across two electronic databases: Scopus and PubMed/MEDLINE. These databases were selected for their complementary coverage: Scopus provides broad interdisciplinary indexing across psychology, neuroscience, and communication sciences, while PubMed captures biomedically oriented research including neuroimaging and clinical cognitive studies. A third database, PsycINFO, was not searched due to the unavailability of institutional access at the University of Pavia during the review period; this represents a limitation acknowledged in Section 2.8.

The search strategy combined three conceptual clusters using Boolean operators. The first cluster targeted the independent variable and included terms such as “media multitasking,” “social media use,” “social media,” and “digital multitasking.” The second cluster targeted cognitive outcomes and included “attention,” “attentional control,” “executive function,” “cognitive control,” “inhibitory control,” and “working memory.” The third cluster specified the population and included “adults,” “young adults,” “university students,” and “college students.” Terms within each cluster were connected with OR; the three clusters were then combined with AND. Figure 1A presents the conceptual structure of the search, and the complete database-specific search strings, filters, and result counts are provided in Appendix B.

The database searches applied publication-year filters covering 2010 to 2025, together with restrictions to English-language journal articles. The 2010 start date was chosen because Ophir et al. (2009) initiated the systematic empirical study of cognitive control in media multitaskers, making 2010 the first full calendar year of consequent research. In Scopus, subject-area filters restricted retrieval to Psychology and Neuroscience; in PubMed, the Humans MeSH filter was applied. The database searches yielded 920 records from Scopus and 325 from PubMed, for a combined total of 1,245 records. After the database searches were complete, two further articles that had been published online in early 2026 were identified through supplementary hand searching of key journals and added to the corpus before the final set of records was closed, bringing the total to 1,247. The eligibility window was therefore 2010 to 2026, with database retrieval covering 2010 to 2025 and the two 2026 records entering exclusively through hand searching; this distinction is made explicit here to avoid any ambiguity in how the search was applied.

## 2.4 Eligibility Criteria

### *Inclusion Criteria*

Studies were included if they met all of the following criteria: (a) published as an original empirical article in a peer-reviewed journal; (b) written in English; (c) included adult or predominantly adult samples, in which participants aged 18 years or older constituted the primary population described, with no upper age limit specified; (d) assessed at least one measure of attention or executive function as a dependent variable using a standardized task or validated questionnaire; (e) examined media multitasking, general social media use, or problematic social media use as an independent variable, predictor, or grouping factor; and (f) published between 2010 and 2026 inclusive.

### *Exclusion Criteria*

Studies were excluded if they: (a) were systematic reviews, scoping reviews, meta-analyses, narrative reviews, or theoretical position papers; (b) were book chapters, conference abstracts, editorials, or grey literature not subject to peer review; (c) included exclusively child or adolescent samples below the age of 18; (d) involved exclusively clinical populations with confirmed neurodevelopmental disorders where cognitive differences would confound the media use-cognition relationship; (e) measured media or technology use without any

corresponding attentional or executive function outcome; or (f) were not available in English at the full-text level, regardless of the language of the abstract.

## 2.5 Screening Process

All 1,247 identified records were imported into Rayyan (version 2.0), a web-based systematic review software platform, where duplicate records were identified and removed. A total of 106 duplicates were detected, yielding 1,141 unique records for title and abstract screening.

Title and abstract screening was conducted by a single reviewer (T.I.) applying the inclusion and exclusion criteria described in Section 2.4. Of the 1,141 unique records, 1,106 were excluded during this phase. The most common reason for exclusion was wrong topic ( $n = 765$ ), reflecting records that contained relevant search terms but did not examine the relationship between media use and attentional or executive function outcomes. Wrong population accounted for 248 exclusions, including studies involving exclusively child, adolescent, or clinical samples. Wrong study design ( $n = 183$ ) captured reviews, meta-analyses, and non-empirical publications. Smaller numbers were excluded for wrong outcome measure ( $n = 8$ ), wrong study duration or timeframe ( $n = 7$ ), wrong publication type such as conference abstracts or editorials ( $n = 4$ ), and non-English language at the title or abstract level ( $n = 2$ ). Exclusion reasons were not mutually exclusive; some records received multiple labels in Rayyan, which is why the categorical totals exceed the number of excluded records.

The remaining 35 records were retrieved for full-text assessment. Following complete reading, seven studies were excluded: two because the full text was not available in English despite an English-language abstract, one because the document was a book chapter rather than a peer-reviewed journal article, one because it was a theoretical review rather than an original empirical study (this paper is instead cited as a conceptual source in Chapter 1), and three because media or social media exposure was measured as an experimental stimulus or intervention rather than as a predictor variable, placing them outside the review's focus on media use as an independent variable. This left 28 empirical studies in the final review. Figure 1B presents the complete PRISMA-ScR flow diagram.

## **2.6 Data Extraction**

Data extraction was conducted by the single reviewer (T.I.) using a standardized form developed for this review and pilot-tested on five randomly selected studies prior to full extraction. For each of the 28 included studies, the following information was recorded: bibliographic details (authors, year of publication, journal title, country of data collection, and DOI); study design (experimental, cross-sectional, longitudinal, or neuroimaging); sample characteristics (total N, mean age and standard deviation, gender distribution, and recruitment setting); independent variable measurement (MMI variant or PSMU scale used, scoring method, and, where applicable, heavy versus light multitasker classification threshold); dependent variable measurement (specific cognitive tasks employed, outcome metrics such as reaction time, error rate, or self-report score, and whether the measure captured attention,

executive functions, or both); direction and magnitude of reported effects, including effect sizes where reported; neuroimaging or psychophysiological measures where applicable, including modality, brain region or ERP component, and key neural findings; and methodological limitations as acknowledged by the study authors. The full extraction template is provided in Appendix C, and the complete extracted data for all 28 studies appear in Appendix A. A condensed summary is presented as Table 3.2 in Chapter 3.

## 2.7 Data Synthesis

Given the heterogeneity of study designs, populations, outcome measures, and analytical approaches across the 28 included studies, a narrative synthesis approach was adopted. Quantitative pooling was not attempted, consistent with JBI guidance for scoping reviews, which recommends descriptive and thematic summaries organized around the review's research questions rather than meta-analytic combination when methodological diversity precludes meaningful aggregation (Peters et al., 2020).

The narrative synthesis was organized around four thematic clusters identified during data extraction: (1) media multitasking and sustained attention, including studies using both performance-based and self-report measures, as well as studies examining specific content formats; (2) media multitasking and core executive functions, covering inhibitory control, working memory, and cognitive flexibility separately; (3) social media use and executive functions, with particular attention to the distinction between general usage and problematic social media use; and (4) neurobiological correlates, encompassing fMRI, EEG, ERP, and

fNIRS evidence. Platform- and content-format-specific findings were integrated into the relevant thematic sections according to their primary cognitive outcome rather than treated as a separate cluster. Within each theme, studies were compared with respect to their methodological approach, sample characteristics, direction of effects, and internal consistency of findings. Where quantitative data such as correlation coefficients or standardized effect sizes were reported, these were presented descriptively to support pattern identification without implying meta-analytic precision.

## **2.8 Methodological Limitations of the Review Process**

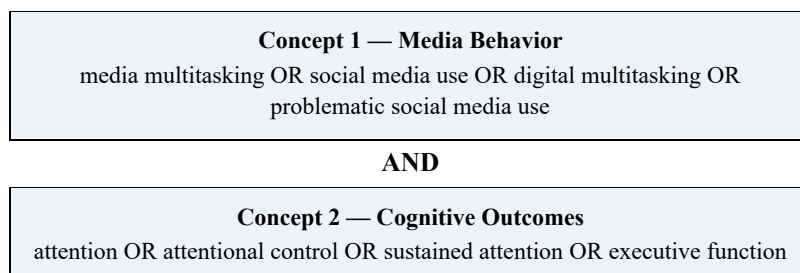
Several limitations of the review process should be acknowledged at the outset. First, all stages of screening and data extraction were conducted by a single reviewer (T.I.), which increases the risk of selection and extraction error relative to independent dual-review designs. The use of Rayyan's structured interface and a standardized extraction form enhanced transparency and reproducibility, but independent verification was not possible within the constraints of a single-author MSc thesis. Second, no formal protocol was registered prospectively, which limits one dimension of methodological transparency, although the review methods were specified before the final screening and extraction stages. Third, PsycINFO was not searched due to the unavailability of institutional access, which may have resulted in the omission of relevant studies indexed primarily in that database; the combination of Scopus and PubMed was nonetheless considered sufficient to capture the majority of empirical work in this area given the interdisciplinary scope of both databases.

Fourth, the restriction to English-language publications may have introduced a geographic bias toward samples from Western and East Asian contexts, which limits the cultural generalizability of the findings. Fifth, the dominant measurement instrument across the included studies, the Media Multitasking Index, relies on retrospective self-report and has known limitations with respect to the objective verification of media behavior and its psychometric consistency across adaptations; this is a limitation of the existing literature as much as of the present review, and it is addressed in Chapter 4. Finally, publication bias cannot be ruled out, since studies reporting null findings may be underrepresented in the published literature, which could inflate the apparent consistency of effects in the included sample. A further limitation concerns the age boundary of the included samples. Three included studies reported age ranges beginning at 17 years: Arness and Ollis (2023) reported a quantitative sample aged 17–58; Shannon et al. (2025) reported a final analytic sample aged 17–33; and the survey sample of Su et al. (2021) spanned 17–31, while its fMRI subsample was aged 19–30. Because the original reports did not provide subgroup counts sufficient to isolate participants under 18, these studies were retained but their age composition is treated as a limitation of population specificity rather than adjusted post hoc. These limitations are considered throughout the synthesis and revisited in Chapter 4.

References cited in this chapter are integrated into the consolidated reference list at the end of the thesis.

### **Figure 1A**

#### *Conceptual Structure of the Search Strategy*



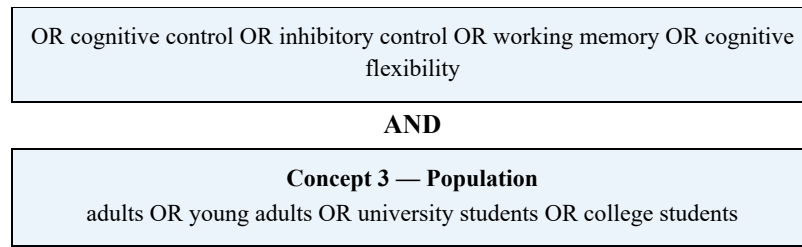


Figure 1A. Conceptual structure of the search. Terms within each concept were combined with OR; the three concepts were combined with AND. This diagram represents the search logic; the complete database-specific search strings, filters, and result counts appear in Appendix B.

**Figure 1B**

*PRISMA-ScR Flow Diagram*

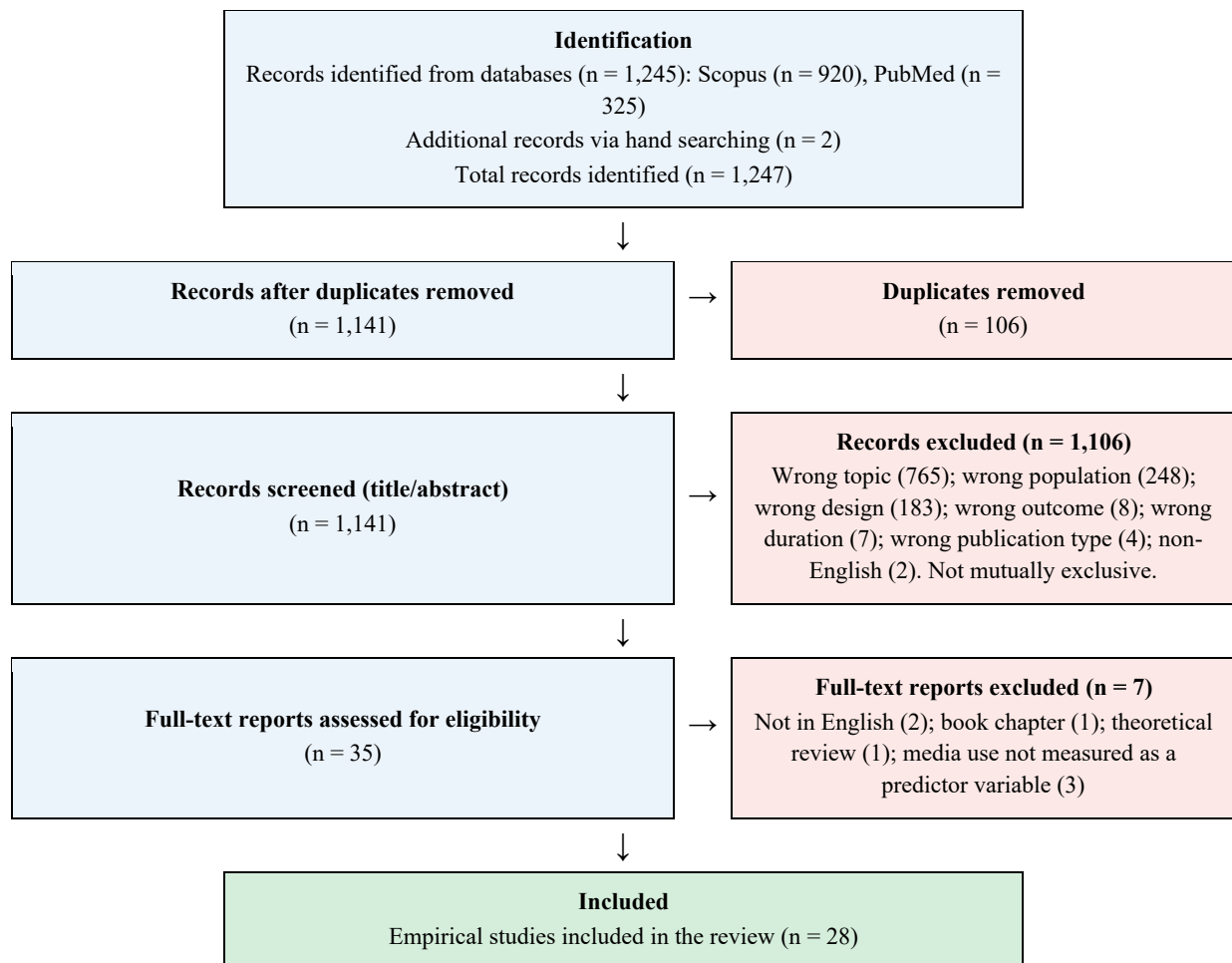


Figure 1B. PRISMA-ScR flow diagram documenting the study selection process. Screening was conducted in Rayyan (v2.0). Exclusion reasons at the title/abstract stage reflect pre-specified eligibility criteria and are not mutually exclusive; some records received multiple labels, so categorical totals exceed the number of excluded records. Two records with a 2026 online-first date were identified through supplementary hand searching. At the full-text stage, three studies were excluded because they employed social media as an experimental stimulus or intervention rather than measuring media use as a predictor variable, and one theoretical review was excluded and is instead cited as a conceptual source in Chapter 1. PsycINFO was not searched due to unavailability of institutional access, as acknowledged in Section 2.8.

## CHAPTER 3

## RESULTS

### 3.1 Overview of Included Studies

The twenty-eight studies reviewed here were published between 2014 and 2026, and they differ from one another in almost every methodological respect that matters. Before the thematic synthesis begins, this section characterizes the corpus as a whole, because several of its structural features shape how the findings can be read and they speak directly to Sub-Question 1, which asks whether sample characteristics condition the results.

Three broad methodological families are represented. Cross-sectional designs are the most numerous, covering survey, correlational, and network-analytic work. Experimental designs come next, from tightly controlled task-switching paradigms to randomized manipulations of media exposure. Six studies used neuroimaging or psychophysiological methods (fMRI, EEG and event-related potentials, or fNIRS), and several of these paired neural measurement with behavioral or survey data. Table 3.1 sets out how these characteristics are distributed, and the full study-level detail appears in Table 3.2 at the end of this chapter.

**Table 3.1.** *Characteristics of the 28 included studies.*

| Characteristic | Category        | n  | Notes                                     |
|----------------|-----------------|----|-------------------------------------------|
| Study design   | Cross-sectional | 15 | Survey, correlational, network-analytic   |
|                | Experimental    | 9  | RCTs and quasi-experimental manipulations |

| Characteristic | Category        | n  | Notes                                    |
|----------------|-----------------|----|------------------------------------------|
|                | Neuroimaging    | 6  | fMRI, EEG/ERP, fNIRS (may overlap above) |
| Sample type    | Student         | 15 | Predominantly undergraduate              |
|                | Community/mixed | 13 | Wider age ranges, platform-recruited     |
| Sample size    | < 100           | 11 | Especially neuroimaging studies          |
|                | 100–500         | 11 |                                          |
|                | > 500           | 6  | Largest: Fisher et al. (2023), N = 2,542 |
| Geography      | North America   | 10 | USA and Canada                           |
|                | Europe          | 6  | UK, Netherlands, Germany, Austria        |
|                | Asia-Pacific    | 10 | China, Japan, Australia, Taiwan, India   |
|                | Middle East     | 2  | Saudi Arabia, Türkiye                    |

Two features of this distribution deserve to be flagged early, because they recur throughout the synthesis. The first is the dominance of student samples. More than half of the studies recruited undergraduates and nobody else, which narrows the range of ages, education levels, and cognitive profiles represented in the literature. A smaller set of studies reached beyond the campus, including Sansevere and Ward (2021), whose participants averaged 37 years, along with Shin et al. (2024) and Kahya et al. (2025), and these become useful reference points precisely because they are unusual. The second feature is the wide spread in sample size, from neuroimaging studies with fewer than 30 participants to the 2,542 young adults surveyed by Fisher et al. (2023). Because statistical power tracks sample size, a null result from a study of 30 and a null result from a study of 900 do not carry the same evidential weight, a distinction that matters in the sections that follow.

The geographic spread was uneven, leaning toward North American and East Asian research groups, with a thinner European and Middle Eastern presence. Every study was published in English, with the cultural and geographic limits already noted in Section 2.8. With the shape of the corpus established, the synthesis now turns to the four thematic clusters. The chapter reports what the studies observed; interpretation of what those observations mean is reserved for Chapter 4.

### **3.2 Theme 1: Media Multitasking and Sustained Attention**

Ten studies addressed sustained attention, which makes this the largest cluster in the review. Across these studies, the association between media multitasking and sustained attention appeared to depend on how attention was measured, and so the self-report evidence is presented separately from the performance-based evidence, with the small set of content-format studies treated on their own.

#### ***3.2.1 Evidence from Self-Report Measures***

When attention was assessed through questionnaires, the association was relatively consistent. Ralph et al. (2014) reported that heavier media multitasking was associated with more frequent attention lapses and more mind wandering ( $r = .28$ ), but not with perceived task-switching ability or environmental distractibility, suggesting an association that was

specific rather than sweeping. Sansevere and Ward (2021) found a comparable pattern in an older community sample, where phubbing and media multitasking were both associated with attention-related cognitive errors across several instruments. In the largest study of the corpus, Fisher et al. (2023) applied network analysis to 2,542 participants and found media multitasking associated with ADHD symptomatology and self-reported attention problems, though the correlations were modest ( $r = .20$  to  $.24$ ) and were driven more by specific media combinations, such as mobile applications and music, than by any single summary score. AlYousef et al. (2025) reported the strongest association of the group, with social media addiction and mindful attention correlating at  $r = -.52$  among health-sciences students. Across these studies, participants who reported heavier media multitasking also tended to report poorer everyday attention.

### *3.2.2 Evidence from Performance-Based Measures*

Studies using objective behavioral tasks produced a more varied pattern. Some aligned with the questionnaire findings. Rioja et al. (2023) administered the same measures across three recruitment platforms and found media multitasking associated with poorer gradCPT performance in each, with effect sizes clustering around  $r = .20$  to  $.21$ . Shin et al. (2024) found heavier media multitasking associated with more commission and omission errors, greater response variability, and more mind wandering without awareness on the SART. Wang and Chen (2026), using eye-tracking during online learning, found that high media multitaskers allocated their gaze differently and showed poorer subsequent learning performance than low multitaskers.

One well-powered performance-based study, however, reported a null result. Wiradhany et al. (2020), using a change-detection task with experience-sampling probes, found no reliable association between media multitasking and distractibility, task performance, or mind wandering, with Bayesian analyses favoring the null hypothesis. Because this study was adequately powered and used an objective task, its null result is not easily attributed to insufficient sensitivity. One interpretation, developed in Chapter 4, is that some of the association observed in questionnaire studies may reflect shared method variance, whereby individuals who report heavy media use also report attentional difficulty without a corresponding difference in objectively measured performance. This divergence between self-report and performance measures is noted here and interpreted in the discussion.

### *3.2.3 Evidence on Content Format*

A small number of studies examined the format of the media consumed rather than the quantity of multitasking. Mahakud and Thapliyal (2026) had participants view sludge content (several video streams at once), regular short-form video, or no media. Sludge content was associated with the steepest decline in sustained attention on a continuous performance test, whereas the same manipulation produced no significant effect on a working memory task within the same participants. This within-study pattern, in which sustained attention was affected while working memory was not, is noted here and returned to in the discussion of the broader selective pattern.

***Summary of Theme 1.** Across the included studies, media multitasking was associated with sustained attention difficulty more consistently under self-report than under performance testing, and one adequately powered change-detection study found no reliable association. The pattern observed was thus measurement-dependent rather than uniform,*

*although its interpretation is constrained by differences in measurement and sample composition.*

### **3.3 Theme 2: Media Multitasking and Core Executive Functions**

Six studies examined the three executive functions in Diamond's (2013) model: inhibition, working memory, and cognitive flexibility. Across these studies, associations between media multitasking and executive function were predominantly weak, selective, or absent, a pattern that held across both correlational and experimental designs and across all three executive domains.

#### ***3.3.1 Predominantly Null Findings Across Executive Domains***

Seddon et al. (2018) conducted the most comprehensive test, administering ten executive function tasks spanning inhibition, working memory, and flexibility; self-reported media multitasking was not reliably associated with performance on any of them, and the only variable it did predict was trait anxiety. The same group later examined the question experimentally: Seddon et al. (2025) randomly assigned participants to simultaneous or sequential media conditions and found no greater post-task decline in the multitasking group, with interaction effects ranging from trivial to small. A correlational null and an experimental null from the same research programme are worth noting together, because the two designs are subject to different confounds. Pablo et al. (2025) examined working memory across six

experiments in pandemic-era and later undergraduate samples and found no reliable association between media usage and working memory, with Bayesian analyses favoring the null across task types and modalities.

### *3.3.2 Partial and Non-Linear Effects*

Two studies reported more circumscribed effects. Müller et al. (2021) found high multitaskers performing worse on the Iowa Gambling Task, fluid intelligence, and a working memory measure, but not on general executive function tasks or objective-risk decision-making, which made the effect selective rather than broad. Colvett et al. (2025) found smaller switch costs among heavy multitaskers in cued task switching but no difference in voluntary switching, confining the effect to externally driven control.

Murphy et al. (2017) reported a non-linear pattern: average media multitaskers made more inhibition errors under high perceptual load than either light or heavy multitaskers. This inverted relationship does not correspond to a simple monotonic effect, and because it has not been replicated, it is reported here as an observation to be interpreted with caution rather than an established finding.

***Summary of Theme 2.*** *Whether examined by correlation or by experiment, media multitasking showed no consistent broad association with core executive functions; the effects that did appear were partial, selective, or non-linear. This contrast with the sustained attention evidence is examined further in Chapter 4.*

### 3.4 Theme 3: Social Media Use and Executive Functions

Six studies examined social media use rather than media multitasking. Across these studies, associations with executive difficulty appeared to depend on how social media engagement was defined: associations were more evident when engagement was measured as problematic use than when it was measured as general frequency.

#### *3.4.1 Problematic Use as the More Consistent Predictor*

Golding et al. (2025) found that TikTok use intensity was associated with poorer executive function, but that this association was fully mediated by problematic social media use; once problematic use and mental health were controlled, TikTok use alone was no longer a significant predictor. This pattern is consistent with the possibility that the problematic pattern of use, rather than time on the platform, carries the association. Cudo et al. (2023) found high Facebook intrusion associated with weaker proactive control, and Arness and Ollis (2023), using structural equation modeling, found attention dysregulation associated with problematic use specifically through impulsive and habitual use patterns. Kahya et al. (2025), in a community sample averaging 37 years, found problematic use associated with poorer self-reported executive functioning, particularly organization, alongside higher depression, anxiety, and stress. The presence of this association outside the undergraduate population is noteworthy given the student dominance of the corpus.

### 3.4.2 Specificity and Boundary Conditions

Two studies indicated boundary conditions on the effect. Reed (2023) found social media addiction associated with greater impulsivity on the Iowa Gambling Task and more inhibition errors, but only on social-media-related no-go trials rather than neutral ones, suggesting a cue-specific rather than general difficulty. Shannon et al. (2025) found problematic use associated with self-reported trait impulsivity, particularly attentional impulsivity, but not with behavioral Go/No-Go or Iowa Gambling performance. This divergence between self-reported impulsivity and measured inhibition parallels the pattern observed in Theme 1.

***Summary of Theme 3.** Social media use was associated with executive difficulty mainly when operationalized as problematic use rather than general frequency, and the associations were often cue-specific or limited to self-report. The distinction between general and problematic use is central to interpreting this evidence and is addressed in relation to Sub-Question 3 in Chapter 4.*

## 3.5 Theme 4: Neurobiological Correlates

Six studies used neuroimaging or psychophysiological methods, which can reveal differences in neural processing that may not be evident behaviorally. Across these studies, neural differences were sometimes observed in the absence of corresponding behavioral differences.

### *3.5.1 Dissociations Between Neural and Behavioral Measures*

Kobayashi et al. (2020) found heavier media multitasking associated with greater degree centrality in the dorsal attention network during an oddball task, but no corresponding association with behavioral attention performance, and the authors advised caution in interpreting the neural finding in the absence of a behavioral correlate. Zhang et al. (2022) found heavy and light multitaskers reaching comparable accuracy on a prospective memory task through different neural routes, with heavy multitaskers recruiting greater monitoring resources, a pattern the authors interpreted as compensatory rather than deficient.

### *3.5.2 Evidence for Neural Change Following Use*

Several studies examined neural and behavioral change associated with social media exposure. Aitken et al. (2025), using fNIRS, found that a fifteen-minute passive Instagram exposure was followed by a significant reduction in Go/No-Go inhibition performance, whereas the working memory (n-back) change-score comparison did not reach significance, though it showed a directionally negative pattern; fNIRS indicated altered prefrontal activation during the executive-function tasks (increased medial and decreased dorsolateral and ventrolateral activity). The sample was small, but the experimental design is one of the few in the corpus capable of supporting a causal inference. Walla and Zheng (2024) found a reduced P300 component in heavy short-video users during an oddball task, interpreted as diminished attention-related processing, and Su et al. (2021) found problematic TikTok use associated with lower self-control and with activation of the default mode network and ventral tegmental area during personalized viewing.

Madore et al. (2020), using EEG and pupillometry, found heavier media multitasking associated with more frequent attention lapsing, which in turn partially accounted for poorer episodic memory. Although Madore and colleagues examined media multitasking rather than exposure to specific content, their combination of neural and behavioral measurement bridges the neurobiological theme and the sustained-attention findings of Theme 1.

***Summary of Theme 4.*** *The neuroimaging studies documented differences in neural processing associated with media multitasking and social media use, but these did not consistently correspond to behavioral differences, and several were interpreted by their authors as compensatory. The neural evidence thus reflected the same ambiguity present in the behavioral literature.*

### 3.6 Summary of Findings Across Themes

Four patterns emerge from the synthesis, and they are described here descriptively; their interpretation is developed in Chapter 4. The first is a difference between cognitive domains. Media multitasking was associated with sustained attention difficulty more consistently than with core executive functions, where associations were predominantly weak, selective, or null. This difference was observed both across studies and, in Mahakud and Thapliyal (2026), within a single experiment in which the same manipulation affected sustained attention but not working memory.

The second pattern is a divergence between measurement types. Self-report measures of sustained attention produced more consistent associations than performance-based measures, and the best-powered performance study produced a null; in the social media literature, problematic use was associated with self-reported impulsivity but not with

behavioral inhibition. Associations observed in self-report measures were thus not consistently reproduced in objective performance tasks.

The third pattern concerns how the predictor was defined. In the social media cluster, associations with executive difficulty were more evident when engagement was operationalized as problematic use than as general frequency, a distinction that parallels the media multitasking literature's own contrast between heavy-user classification and continuous measurement.

The fourth pattern concerns sampling. Rioja et al. (2023) observed effect sizes varying across recruitment platforms under identical measurement, while the studies using older community samples did not diverge systematically in direction from the student-based work. Sampling therefore appeared to influence the magnitude of associations more than their direction. These four patterns provide the descriptive basis for the interpretation offered in Chapter 4.

\* \* \*

**Table 3.2a.** *Characteristics of the 28 included studies, ordered by thematic cluster.*

| #  | Author (Year)              | Country      | Design          | N         | IV (measure)               | DV (measure)                  |
|----|----------------------------|--------------|-----------------|-----------|----------------------------|-------------------------------|
| 1  | Drody et al. (2025)        | Canada       | Experimental    | 166 / 284 | Behavioral MM (video task) | 1-back sustained attention    |
| 2  | AlYousef et al. (2025)     | Saudi Arabia | Cross-sectional | 335       | BSMAS                      | MAAS                          |
| 3  | Sansevere & Ward (2021)    | USA          | Cross-sectional | 373       | MMI-2; Phubbing scale      | MAAS-LO, ARCES (self-report)  |
| 4  | Wiradhany et al. (2020)    | Netherlands  | Cross-sectional | 261       | MMS (short MMI)            | Change-detection task         |
| 5  | Fisher et al. (2023)       | USA          | Cross-sectional | 2,542     | MMI (network)              | ASRS, ARCES (self-report)     |
| 6  | Shin et al. (2024)         | Australia    | Cross-sectional | 238       | MMI (modified)             | SART                          |
| 7  | Rioja et al. (2023)        | Netherlands  | Cross-sectional | 924       | MMI; F-MMI                 | gradCPT + self-report         |
| 8  | Mahakud & Thapliyal (2026) | India        | Experimental    | 48        | SM use classification      | CPT; working-memory task      |
| 9  | Wang & Chen (2026)         | Taiwan       | Cross-sectional | 46        | Modified MMI               | Eye-tracking; vocabulary test |
| 10 | Ralph et al. (2014)        | Canada       | Cross-sectional | 202       | MMI                        | MAAS-LO, ARCES (self-report)  |

|    |                         |           |                 |           |                                |                                     |
|----|-------------------------|-----------|-----------------|-----------|--------------------------------|-------------------------------------|
| 11 | Colvett et al. (2025)   | USA       | Experimental    | 44        | MMI; MMES                      | Task switching (cued/voluntary)     |
| 12 | Pablo et al. (2025)     | USA       | Experimental    | 71-284    | Screen time (verified)         | Change detection; n-back            |
| 13 | Müller et al. (2021)    | Germany   | Cross-sectional | 44        | Adapted MMI; s-IAT             | ARCES; decision-making tasks        |
| 14 | Murphy et al. (2017)    | Australia | Cross-sectional | 85        | MMI (LMM/AMM/HMM)              | Flanker; Go/No-Go                   |
| 15 | Seddon et al. (2018)    | UK        | Cross-sectional | 112       | Adapted MMI                    | Flanker, Go/No-Go (10-task battery) |
| 16 | Seddon et al. (2025)    | UK        | Experimental    | 76        | Experimental MM manipulation   | Flanker, Go/No-Go                   |
| 17 | Cudo et al. (2023)      | Poland    | Experimental    | 82        | Facebook Intrusion Scale (FIS) | AX-CPT                              |
| 18 | Arness & Ollis (2023)   | Australia | Mixed-methods   | 607       | BSMAS; use motives             | ASRS (attention dysregulation)      |
| 19 | Reed (2023)             | UK        | Experimental    | 378 / 165 | BSMAS; SMAS                    | Stroop, WCST, IGT, Go/No-Go         |
| 20 | Golding et al. (2025)   | USA       | Cross-sectional | 346       | TikTok Intensity; PSMU         | BRIEF-A (self-report EF)            |
| 21 | Shannon et al. (2025)   | Canada    | Cross-sectional | 503       | BSMAS (PSMU)                   | Go/No-Go; IGT                       |
| 22 | Kahya et al. (2025)     | Türkiye   | Cross-sectional | 174       | BSMAS (PSMU)                   | EFI (self-report)                   |
| 23 | Su et al. (2021)        | China     | Neuroimaging    | 208 / 30  | Problematic TikTok Use (PTU)   | Self-Control Scale; fMRI            |
| 24 | Walla & Zheng (2024)    | NR        | Experimental    | 29        | Short-video use (self-report)  | Visual oddball (P300 ERP)           |
| 25 | Zhang et al. (2022)     | China     | Experimental    | 106       | Chinese MUQ (HMM/LMM)          | Prospective memory (ERP)            |
| 26 | Aitken et al. (2025)    | USA       | Neuroimaging    | 20        | Instagram (15-min passive)     | n-back; Go/No-Go; fNIRS             |
| 27 | Kobayashi et al. (2020) | Japan     | Neuroimaging    | 103       | MMI (Japanese MMQ)             | Visual CPT; auditory oddball; fMRI  |
| 28 | Madore et al. (2020)    | USA       | Cross-sectional | 80        | Modified MMI                   | gradCPT; EEG; pupillometry          |

**Table 3.2b.** *Direction of effects and key findings of the 28 included studies.*

| #  | Author (Year)              | Direction | Key Finding                                                                                                                                                                                                                                                                                        |
|----|----------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Drody et al. (2025)        | Mixed     | Increasing motivation reduced the temporal rise in media multitasking and slowed performance decline during prolonged tasks. Declining motivation, rather than attentional depletion alone, helps explain the drift into multitasking over time.                                                   |
| 2  | AlYousef et al. (2025)     | Negative  | In regression models, higher scores on a social-media-addiction scale were linked to lower mindful-attention scores independently of covariates, among health-sciences students.                                                                                                                   |
| 3  | Sansevere & Ward (2021)    | Positive  | Phubbing and media multitasking were both positively associated with everyday attentional failures, mind wandering, and attention-related cognitive errors. The two behaviours were related but distinguishable.                                                                                   |
| 4  | Wiradhany et al. (2020)    | Null      | In this well-powered change-detection study, heavier media multitasking was not reliably related to distractibility, task performance, or mind wandering, and the Bayesian evidence pointed toward the absence of an effect.                                                                       |
| 5  | Fisher et al. (2023)       | Positive  | Higher media multitasking was related to greater ADHD symptoms and attention failures, though correlations were weak. Mobile apps and music were the media behaviours most strongly tied to attention problems.                                                                                    |
| 6  | Shin et al. (2024)         | Negative  | Heavier media multitasking was linked to more omission and commission errors and greater response variability on the SART, plus more mind wandering without awareness.                                                                                                                             |
| 7  | Rioja et al. (2023)        | Negative  | A negative association between media multitasking and sustained attention replicated across three independent samples ( $r \approx 0.20-0.21$ ) on both task and self-report measures, though effect sizes varied by recruitment platform.                                                         |
| 8  | Mahakud & Thapliyal (2026) | Mixed     | Among the video formats compared, the sludge (multi-stream) condition was followed by the steepest drop in sustained-attention performance, while working-memory scores did not differ significantly between the format conditions within the same participants.                                   |
| 9  | Wang & Chen (2026)         | Negative  | Both groups initially attended to the instructional content, but their fixation sequences differed. The low-MM group significantly outperformed the high-MM group on the post-test vocabulary measure, indicating poorer learning under heavier multitasking.                                      |
| 10 | Ralph et al. (2014)        | Mixed     | Higher media multitasking was associated with more self-reported attention lapses, attention-related errors, and mind wandering, but not with perceived memory failures, switching ability, or environmental distractibility.                                                                      |
| 11 | Colvett et al. (2025)      | Mixed     | Heavy media multitaskers showed smaller switch costs than light multitaskers in externally cued task switching, but not in voluntary switching, suggesting a link specific to externally guided control.                                                                                           |
| 12 | Pablo et al. (2025)        | Null      | Across the six experimental datasets, neither verified nor estimated media-use duration showed a reliable association with working-memory performance; Bayesian analyses favoured the null across task types and both cohorts.                                                                     |
| 13 | Müller et al. (2021)       | Mixed     | Heavy multitaskers performed worse than light multitaskers on the Iowa Gambling Task, fluid intelligence, and working memory, but showed no significant differences on general executive-function tasks.                                                                                           |
| 14 | Murphy et al. (2017)       | Mixed     | There were no media-group differences on flanker filtering. Under high perceptual load, average multitaskers made more No-Go errors than both light and heavy multitaskers, an unexpected non-linear pattern.                                                                                      |
| 15 | Seddon et al. (2018)       | Null      | Across a ten-task battery spanning inhibition, working memory, and flexibility, self-reported media multitasking predicted none of the executive measures reliably; the only variable it tracked was trait anxiety.                                                                                |
| 16 | Seddon et al. (2025)       | Null      | There were no significant time-by-group interactions: media multitasking did not produce greater post-task executive-function decline than sequential media use, across working memory, inhibition, and flexibility.                                                                               |
| 17 | Cudo et al. (2023)         | Negative  | High Facebook intrusion associated with greater reactive and deficits in proactive cognitive control, especially in Facebook-related and positive emotional contexts.                                                                                                                              |
| 18 | Arness & Ollis (2023)      | Positive  | In a structural model, attention dysregulation was linked to problematic use primarily via impulsive and habitual patterns of engagement rather than through frequency of use alone.                                                                                                               |
| 19 | Reed (2023)                | Mixed     | Social media addiction was related to greater IGT impulsivity and more inhibition errors on social-media-related No-Go trials, but not on neutral tasks, indicating a cue-specific rather than general difficulty.                                                                                 |
| 20 | Golding et al. (2025)      | Negative  | The link between TikTok use intensity and weaker executive functioning operated entirely through problematic social media use in a survey-based statistical mediation; once problematic use and mental-health covariates were accounted for, platform time no longer predicted executive outcomes. |
| 21 | Shannon et al. (2025)      | Mixed     | Higher problematic use was related to greater trait impulsivity, especially attentional impulsivity, but not to behavioural inhibitory-control performance on Go/No-Go or the IGT.                                                                                                                 |
| 22 | Kahya et al. (2025)        | Mixed     | Higher problematic use was associated with poorer self-reported executive functioning, particularly organization, and with greater depression, anxiety, and stress.                                                                                                                                |
| 23 | Su et al. (2021)           | Negative  | Problematic TikTok use was negatively correlated with self-control. Personalized video recommendations activated the default mode network and ventral tegmental area, suggesting a neural basis for addiction-like engagement.                                                                     |
| 24 | Walla & Zheng (2024)       | Negative  | Heavy short-video social media users showed significantly reduced P300 amplitude in a visual oddball task, indicating weaker attention-related neural processing compared to regular users.                                                                                                        |

|    |                         |          |                                                                                                                                                                                                                                                                                                                      |
|----|-------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 25 | Zhang et al. (2022)     | Mixed    | The two multitasking groups reached similar prospective-memory accuracy, but heavier multitaskers appeared to recruit greater monitoring-related neural resources to do so, a profile the authors read as compensatory.                                                                                              |
| 26 | Aitken et al. (2025)    | Negative | A 15-minute passive Instagram exposure was followed by a significant reduction in Go/No-Go performance; the n-back change-score comparison was not significant ( $p_{adj} = .17$ ) but was directionally negative. fNIRS showed increased medial and decreased dorsolateral and ventrolateral prefrontal activation. |
| 27 | Kobayashi et al. (2020) | Mixed    | Higher media multitasking was associated with greater degree centrality in the dorsal attention network during the oddball task, but was not significantly related to behavioural attention performance.                                                                                                             |
| 28 | Madore et al. (2020)    | Negative | Heavier media multitasking was associated with poorer episodic memory and more frequent sustained-attention lapsing, with attention lapses partially accounting for the memory relationship.                                                                                                                         |

**Note.** *IV* = independent variable; *DV* = dependent variable; *MMI* = Media Multitasking Index; *PSMU* = problematic social media use; *EF* = executive function. Full extraction for each study appears in Appendix A.

## **CHAPTER 4**

### **DISCUSSION**

#### **4.1 Principal Finding: A Domain-Specific Pattern**

This review does not support a unitary account in which media multitasking broadly compromises adult cognition. Instead, the 28 included studies point to a domain-specific pattern: associations with sustained attention were more consistent than associations with core executive functions, while findings related to social media depended substantially on whether engagement was measured as general frequency or problematic use.

The difference between sustained attention and executive functions was visible both across studies and within individual experiments. In the study by Mahakud and Thapliyal (2026), the same media-content manipulation was associated with poorer sustained-attention performance but not with a significant difference in working memory. This within-study contrast suggests that the observed pattern cannot be reduced entirely to differences between samples or research designs.

The findings should nevertheless be interpreted cautiously. The evidence base combines cross-sectional, experimental, neuroimaging, and self-report studies that differ in sample composition, construct operationalization, and outcome measurement. This selective pattern may therefore reflect both differences in the vulnerability of cognitive domains and differences in how those domains have been measured.

The central theoretical question is consequently not whether media multitasking is associated with cognition in general. It is whether the available evidence supports a selective

relationship with sustained attention, a broader disruption of executive control, or a combination of attentional costs and task-specific adaptation.

A note on terminology is warranted before the hypotheses are examined. Throughout this discussion, consistency refers to the recurrence of a similar directional pattern across independent studies within the same measurement domain, rather than to a formal statistical criterion. It does not imply that all studies produced statistically significant effects, nor that study quality was formally weighted, since no risk-of-bias appraisal was conducted. The synthesis is therefore narrative and provisional, and claims of greater or lesser consistency should be read in that light.

## **4.2 Evaluation of the Three Hypotheses**

### ***4.2.1 The Attentional Depletion Hypothesis***

The attentional depletion hypothesis proposes that frequent engagement with multiple media streams gradually reduces the resources available for endogenous attentional control. In its broadest form, the hypothesis predicts that habitual multitasking should produce widespread reductions in executive functioning. In a narrower form, it predicts greater difficulty sustaining attention, particularly during prolonged or low-reward tasks.

The evidence in this review provides partial support for the narrower version. Several studies associated heavier media multitasking with more frequent attentional lapses, mind wandering, or reduced attentional stability. Ralph et al. (2014), Shin et al. (2024), and Madore et al. (2020) provide converging examples of this pattern, although the measures and designs differed across studies. Madore et al. (2020) further linked media multitasking to attentional lapsing indexed by alpha power and pupil variability, with attentional lapses partly accounting for poorer memory performance.

A general depletion account, however, predicts broader effects than those observed. If media multitasking reduced a general pool of executive resources, working memory and inhibition should be affected alongside sustained attention. The predominantly weak or null findings across core executive functions are therefore difficult to reconcile with a generalized depletion model.

The evidence is more compatible with a circumscribed account in which media multitasking is associated with difficulty maintaining attention under unrewarding or prolonged task conditions. This pattern may involve motivation, task engagement, or the allocation of attentional effort rather than a general reduction in executive capacity. Drody et al. (2025), for example, found that the drift toward multitasking during a prolonged task resembled a vigilance decrement and was reduced when motivation was increased.

This interpretation remains provisional. Most of the evidence linking habitual media multitasking to attentional difficulty is correlational, and the experimental evidence remains limited. The findings are therefore consistent with a selective attentional cost, but they do not establish that chronic media multitasking directly depletes a general cognitive resource.

#### *4.2.2 The Scattered Attention Hypothesis*

The scattered attention hypothesis, associated with Ophir et al. (2009), proposes that heavy media multitaskers develop a broader attentional filter and become more susceptible to irrelevant information. This account predicts impairments in filtering, distraction resistance, and the suppression of task-irrelevant representations.

The present corpus provides limited support for this hypothesis. Filtering and inhibition tasks generally produced null or inconsistent results. Murphy et al. (2017) found no overall group difference on the flanker task, and Seddon et al. (2018) found no reliable

association between self-reported media multitasking and performance across a broad executive-function battery.

The neurobiological findings are similarly difficult to interpret as evidence of a broad filtering deficit. Kobayashi et al. (2020) reported differences in dorsal-attention-network connectivity among heavier media multitaskers, but these neural differences were not accompanied by a corresponding behavioural difference in filtering. Neural variation may therefore reflect altered processing or compensatory recruitment without necessarily indicating impaired executive performance.

The scattered attention hypothesis should consequently be treated as weakly supported in the present review. It may describe some aspects of attentional processing in particular contexts, but the available evidence does not demonstrate a reliable, general reduction in the ability to filter irrelevant information.

#### *4.2.3 The Trained Attention Hypothesis*

The trained attention hypothesis proposes that frequent switching between media streams may strengthen certain forms of cognitive flexibility or attentional reallocation. This account predicts that heavy media multitaskers may perform better, or at least maintain performance more efficiently, on tasks requiring rapid switching or monitoring.

The evidence provides support only for a narrow interpretation of this hypothesis. Colvett et al. (2025) found lower switch costs among heavy media multitaskers in externally cued switching, but not in voluntary switching. Zhang et al. (2022) found comparable prospective-memory accuracy in heavy and light media multitaskers, although the two groups appeared to rely on different neural strategies.

These findings do not establish a general cognitive advantage. They are more consistent with task-specific adaptation or compensation. Heavy media multitaskers may maintain performance under some conditions by recruiting greater monitoring resources or by adapting to environments that require frequent externally prompted switching. Such adaptation may preserve accuracy while increasing processing demands.

Taken together, the three hypotheses each capture part of the evidence but none explains the complete pattern. The depletion account is most consistent with sustained-attention findings but overpredicts broad executive impairment. The scattered attention account predicts filtering deficits that are not reliably observed. The trained attention account captures a limited pattern of adaptation but does not demonstrate a general benefit. The evidence therefore favours a domain-specific interpretation rather than any of the three hypotheses in their original global form.

## **4.3 Cross-Cutting Methodological Patterns**

### ***4.3.1 Self-Report and Performance-Based Measures***

A major pattern across the review is the divergence between self-report and performance-based measures. Self-report studies more often associated media multitasking with attentional difficulty, whereas objective performance measures produced weaker, null, or less consistent findings. A similar divergence appeared in the social media literature, where problematic use was associated with self-reported impulsivity but not consistently with behavioural inhibition.

One possible contributor is shared method variance. When both the predictor and the outcome are self-reported, their association may partly reflect a shared disposition, such as negative self-appraisal, heightened symptom awareness, or a general tendency to report difficulties across domains. This possibility does not make self-report findings irrelevant.

Subjective attentional difficulty is itself an important aspect of everyday functioning, and brief laboratory tasks may not capture all forms of real-world cognitive difficulty.

The findings of this review become more meaningful when read together with the affect-regulation framework introduced in Chapter 1. The fact that people continue to engage in media multitasking despite its cognitive costs suggests that the behaviour serves an emotional function, whether as an escape from boredom, a source of immediate gratification, or a way of maintaining social connection (Wang & Tchernev, 2012; Wiradhany, Baumgartner, & de Bruin, 2021). This emotional dimension may also help explain why some studies find robust associations in self-report measures but not in objective performance-based measures: the subjective experience of attentional difficulty is related both to media use and to the person's emotional state, but it does not always correspond to a measurable cognitive impairment. Orben's caution in the well-being literature, concerning small effects and exaggerated panic, parallels the findings of this review in the domain of attention and executive functions (Orben & Przybylski, 2019a). In both fields, the evidence is more measured and more complex than the popular narrative suggests. For this reason, the cognitive correlates of media multitasking should be evaluated not only in cognitive terms, but also within an emotional and motivational context.

The implication is that self-report associations should not be interpreted automatically as evidence of objective cognitive impairment. Future studies should combine validated self-report measures with behavioural tasks, experience sampling, and, where appropriate, passive or logged measures of media use. This would make it possible to determine whether subjective difficulties, laboratory performance, and actual media behaviour converge.

### **4.3.2 General Use and Problematic Use**

The second cross-cutting pattern concerns the operationalization of social media engagement. Associations with executive difficulty were more evident when engagement was measured as problematic or dysregulated use than when it was measured as general frequency or time spent on a platform. Golding et al. (2025) provide a particularly clear example: the relationship between TikTok intensity and executive-function difficulty was mediated by problematic social media use, and platform time was no longer a significant predictor once problematic use was controlled.

This distinction suggests that the quantity of social media use should not be treated as interchangeable with the quality or functional pattern of use. Ordinary engagement may be frequent without being compulsive, whereas problematic use includes features such as loss of control, salience, conflict, and continued engagement despite negative consequences.

The practical implication is that interventions focused only on reducing screen time may target an imprecise risk factor. Research and intervention design should distinguish duration, content, motivation, and dysregulated use rather than treating all social media engagement as a single exposure. This conclusion should nevertheless remain cautious because several studies in this cluster relied on self-report measures of problematic use and self-reported executive difficulty.

## **4.4 A Non-Linear Finding**

The general pattern identified in this review is not entirely monotonic. Murphy et al. (2017) found that average media multitaskers made more response-inhibition errors than both light and heavy media multitaskers under high perceptual load. The poorest performance was therefore observed in the middle group rather than at the highest level of media multitasking.

This finding does not correspond neatly to any of the three hypotheses, all of which generally assume that heavier media multitasking should produce larger effects. Because the result has not been consistently replicated, it should not be used to support a general non-linear model. It is better treated as a theoretically relevant anomaly that identifies a limitation in the field's tendency to assume a simple linear relationship between media use and cognitive performance.

One possible explanation is that heavy multitaskers may develop compensatory strategies that are not yet present among average multitaskers. This interpretation remains speculative and should not be presented as an established mechanism. Future studies should test for non-linear associations directly rather than assuming that increasing media multitasking will produce proportionally increasing cognitive costs.

## 4.5 Limitations

### *4.5.1 Limitations of the Review Process*

Several limitations concern the review process itself. Screening and data extraction were conducted by a single reviewer, which increases the risk of selection and coding error relative to independent dual review. The review also searched two databases rather than a broader database set, and PsycINFO was not included because institutional access was unavailable. In addition, no protocol was registered prospectively, and the review was restricted to English-language publications.

These limitations do not invalidate the synthesis, but they constrain the level of certainty that can be attached to the more specific conclusions. The central difference between sustained attention and core executive functions appears across multiple study types, but the precise magnitude and boundary conditions of this difference should be regarded as provisional.

#### *4.5.2 Limitations of the Included Evidence*

The evidence base is limited by its heavy reliance on undergraduate samples. More than half of the included studies recruited students exclusively, which narrows the age range and raises the possibility that some findings reflect a particular developmental or educational context rather than adults in general. The small number of studies involving older community samples is not sufficient to establish generalizability across the adult lifespan.

The limited number of longitudinal studies is a second major concern. Because most studies were cross-sectional, the direction of the observed relationships remains open. Heavier media multitasking may contribute to attentional difficulty, individuals with weaker attention may be more likely to engage in multitasking, or a third factor may contribute to both. The experimental studies that could provide stronger evidence for causal interpretation are relatively few and often rely on small samples.

The included studies also differ in their task demands, media-use measures, and definitions of heavy or problematic use. These differences limit direct comparison and make it difficult to determine whether apparently inconsistent findings reflect genuine moderation or methodological variation.

#### *4.5.3 Conceptual and Measurement Limitations*

The Media Multitasking Index is the dominant measure in this literature, but it relies on retrospective self-report and aggregates diverse media combinations into a single score. This may obscure effects associated with particular combinations of media, specific content formats, or particular motivations for use.

The divergence between self-report and performance-based measures is therefore not only a substantive finding. It is also a measurement problem. Different operationalizations of media multitasking and cognitive performance do not consistently converge, and the

heterogeneity of outcome measures, ranging from questionnaires to reaction-time tasks and neural indices, makes quantitative comparison approximate.

The present review did not conduct a formal risk-of-bias or quality appraisal, consistent with its scoping-review design. Consequently, stronger and weaker studies contribute to the narrative synthesis without being statistically weighted according to methodological quality. The conclusions should therefore be understood as a map of the evidence rather than as a definitive estimate of the size of any effect.

#### **4.6 Implications and Directions for Future Research**

Several priorities follow from the findings. First, longitudinal research is needed to clarify the direction of the relationship between media multitasking and attention. Additional cross-sectional studies may describe the association more precisely, but they cannot determine whether media multitasking precedes attentional difficulty or whether attentional characteristics influence media-use behaviour.

Second, future research should combine self-report and objective measures. Studies should report media-use behaviour, subjective attentional experience, behavioural performance, and, where relevant, neural or psychophysiological measures within the same design. This would allow researchers to examine whether these measures align or capture different aspects of cognition.

Third, researchers should test non-linear relationships and potential moderators rather than assuming a simple linear dose-response pattern. Relevant moderators may include task reward, motivation, media content, age, recruitment source, baseline attentional ability, and whether engagement is ordinary or problematic.

Fourth, media multitasking should be treated as a set of behaviours rather than a single quantity. The MMI and related aggregate measures may be useful for broad mapping, but future research should also distinguish the content, timing, motivation, and context of media use. Network-based approaches and behaviourally verified measures may help identify which components of media use are most relevant to cognitive outcomes.

For public communication, the evidence supports a more precise account than the claim that social media and multitasking broadly erode cognitive faculties. Heavier or experimentally manipulated media multitasking was more consistently associated with sustained-attention difficulty than with reliable differences in core executive functions. Social media-related executive difficulties were more evident in the context of problematic, dysregulated use than in relation to ordinary frequency alone.

These findings do not establish that media multitasking is harmless. They indicate that its cognitive correlates are selective, measurement-dependent, and likely moderated by task and user characteristics. Precision in defining the cognitive domain and the type of media engagement is therefore more informative than a general claim of cognitive decline.

## CHAPTER 5

### CONCLUSION

#### 5.1 Answering the Research Questions

This scoping review examined how media multitasking and social media use relate to attention and executive functions in adults, how these relationships have been measured, and whether the existing evidence supports a general or domain-specific account of cognitive change.

##### *Main Research Question*

The evidence supports a specific rather than a general conclusion. Media multitasking was more consistently associated with difficulty sustaining attention than with reliable differences in inhibition, working memory, or cognitive flexibility. The relationship was conceptualized through three competing hypotheses and examined using heterogeneous self-report, behavioural, experimental, and neurobiological measures. Much of the apparent disagreement in the literature reflects differences in measurement, operationalization, sample composition, and task demands rather than a single uniform cognitive effect.

##### *Sub-Question 1: Sample Characteristics*

Sample characteristics appeared to influence the magnitude of observed associations more clearly than their direction. Studies using different recruitment platforms produced different effect sizes, while the limited evidence from older or community samples did not consistently contradict findings from student samples. However, the small number of studies involving adults beyond university populations prevents confident generalization across the adult lifespan.

### *Sub-Question 2: Consistency Across Cognitive Domains*

The evidence was not equally consistent across cognitive domains. Associations between media multitasking and sustained-attention difficulty were more consistent than associations involving core executive functions. Findings for inhibition, working memory, and cognitive flexibility were predominantly weak, selective, or null. The most accurate summary of the literature is therefore a difference in the consistency of effects across domains, rather than a uniform account of cognitive decline.

### *Sub-Question 3: General and Problematic Social Media Use*

General and problematic social media use showed different relationships with cognitive outcomes. Executive-function difficulties were more evident when engagement was operationalized as problematic or dysregulated use than when it was measured as general frequency or time spent on a platform. Time alone was a weak predictor of executive difficulty in the reviewed literature, whereas the pattern and functional consequences of use appeared more informative.

## **5.2 Contribution of the Review**

The principal contribution of this review is the identification of a selective, domain-linked structure within a literature often described as contradictory. Separating sustained attention from core executive functions, distinguishing self-report from performance-based measures, and differentiating general from problematic social media use allows apparently inconsistent findings to be interpreted within a more coherent framework.

A second contribution is methodological. The recurring divergence between subjective reports and objective performance indicates that the two forms of measurement should not be treated as interchangeable. When both media use and cognitive difficulty are self-reported, their association may partly reflect a shared disposition rather than an objective

difference in cognitive performance. At the same time, subjective difficulty remains relevant because it may capture aspects of everyday functioning that laboratory tasks do not fully measure.

The review therefore does not establish a single effect size or a universal causal mechanism. Its contribution is to map the conditions under which associations appear more or less consistently and to identify the methodological distinctions that future research must address.

### 5.3 Concluding Remarks

The evidence assembled in this review does not support the broad claim that ordinary media multitasking and social media use uniformly erode adult cognition. It supports a more limited interpretation. Heavier media multitasking was more consistently associated with difficulty sustaining attention, particularly under prolonged or low-reward conditions, whereas associations with core executive functions were generally weak, selective, or absent. Problematic social media use showed stronger relationships with executive difficulty than general frequency alone.

This conclusion should not be interpreted as evidence that media multitasking is harmless. Attentional difficulty may affect learning, everyday functioning, and the ability to remain engaged with unrewarding tasks. The appropriate conclusion is instead that cognitive effects should be described with greater precision, distinguishing the domains that show relatively consistent associations from those for which the evidence remains limited.

The main value of this review lies in defining the boundaries of the current evidence. Media multitasking should not be treated as a single, uniform exposure, and executive functions should not be treated as a single undifferentiated outcome. Future research will

require longitudinal designs, objective and subjective measures used together, clearer distinctions between ordinary and problematic use, and greater attention to non-linear and task-specific effects.

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## APPENDIX A

### Complete Data Extraction for the 28 Included Studies

*Each study is presented as a separate entry, ordered by thematic cluster. Fields not reported in the source are marked accordingly.*

#### THEME 1: Sustained Attention

##### Study 1. Drody et al. (2025)

|                                |                                                                                                                                                                                                                      |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Frontiers in Cognition                                                                                                                                                                                               |
| <b>Country</b>                 | Canada (University of Waterloo)                                                                                                                                                                                      |
| <b>Study design</b>            | Experimental (2 studies, block design)                                                                                                                                                                               |
| <b>Sample (N)</b>              | Study 1: N=166; Study 2: N=284 (final)                                                                                                                                                                               |
| <b>Mean age (SD)</b>           | S1: 19.43 (2.47); S2: 20.00 (3.40)                                                                                                                                                                                   |
| <b>% Female</b>                | S2: ~81% female (231/284); S1: NR                                                                                                                                                                                    |
| <b>Sample type</b>             | Student (undergraduate)                                                                                                                                                                                              |
| <b>IV/ MM measure</b>          | Behavioral MM; video lecture opening/closing (not MMI)                                                                                                                                                               |
| <b>IV/ SM measure</b>          | -                                                                                                                                                                                                                    |
| <b>DV/ Attention</b>           | 1-back sustained attention task (vigilance-like)                                                                                                                                                                     |
| <b>DV / Executive function</b> | 1-back performance (hits, false alarms)                                                                                                                                                                              |
| <b>Direction of effect</b>     | Mixed; MM increased + performance declined over time; motivation manipulation reversed both                                                                                                                          |
| <b>Effect size</b>             | Block × Condition interaction significant; no single ES reported                                                                                                                                                     |
| <b>Neural measure</b>          | -                                                                                                                                                                                                                    |
| <b>Key finding</b>             | Increasing motivation reduced temporal increases in media multitasking and slowed performance decline during prolonged tasks. Declining motivation, not just attentional depletion, explains why MM rises over time. |

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**Study 2. AlYousef et al. (2025)**

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|                                |                                                                                                                                                                                  |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Journal of Family and Community Medicine                                                                                                                                         |
| <b>Country</b>                 | Saudi Arabia                                                                                                                                                                     |
| <b>Study design</b>            | Cross-sectional (survey)                                                                                                                                                         |
| <b>Sample (N)</b>              | 335                                                                                                                                                                              |
| <b>Mean age (SD)</b>           | 20.59 (1.83)                                                                                                                                                                     |
| <b>% Female</b>                | 79.4%                                                                                                                                                                            |
| <b>Sample type</b>             | Student (health colleges)                                                                                                                                                        |
| <b>IV / MM measure</b>         | Not reported                                                                                                                                                                     |
| <b>IV / SM measure</b>         | BSMAS (Bergen Social Media Addiction Scale) + general SM use                                                                                                                     |
| <b>DV / Attention</b>          | MAAS (Mindful Attention Awareness Scale, self-report)                                                                                                                            |
| <b>DV / Executive function</b> | -                                                                                                                                                                                |
| <b>Direction of effect</b>     | Negative (higher BSMAS → lower MAAS)                                                                                                                                             |
| <b>Effect size</b>             | $r = -0.519$                                                                                                                                                                     |
| <b>Neural measure</b>          | -                                                                                                                                                                                |
| <b>Key finding</b>             | In regression models, higher scores on a social-media-addiction scale were linked to lower mindful-attention scores independently of covariates, among health-sciences students. |

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### Study 3. Sansevere & Ward (2021)

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|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Future Internet                                                                                                                                                                                         |
| <b>Country</b>                 | USA (online)                                                                                                                                                                                            |
| <b>Study design</b>            | Cross-sectional (self-report)                                                                                                                                                                           |
| <b>Sample (N)</b>              | 373                                                                                                                                                                                                     |
| <b>Mean age (SD)</b>           | 37.40 (community; note older sample)                                                                                                                                                                    |
| <b>% Female</b>                | 38%                                                                                                                                                                                                     |
| <b>Sample type</b>             | Community (US adults)                                                                                                                                                                                   |
| <b>IV / MM measure</b>         | MMI-2 + MMM-S                                                                                                                                                                                           |
| <b>IV / SM measure</b>         | Generic Scale of Phubbing + media use questionnaire                                                                                                                                                     |
| <b>DV / Attention</b>          | AC-S, AC-D, MW-D, MW-S, MAAS-LO, ARCES (self-report)                                                                                                                                                    |
| <b>DV / Executive function</b> | -                                                                                                                                                                                                       |
| <b>Direction of effect</b>     | Positive (more phubbing/MM → more attentional failures)                                                                                                                                                 |
| <b>Effect size</b>             | $r_s = 0.18-0.72$ ; MMI-2/MMM-S $r=0.81$                                                                                                                                                                |
| <b>Neural measure</b>          | -                                                                                                                                                                                                       |
| <b>Key finding</b>             | Phubbing and media multitasking were both positively associated with everyday attentional failures, mind wandering, and attention-related cognitive errors. The two behaviors are related but distinct. |

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**Study 4. Wiradhany et al. (2020)**

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|                                |                                                                                                                                                                                                                              |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Attention, Perception, & Psychophysics                                                                                                                                                                                       |
| <b>Country</b>                 | Netherlands (Groningen)                                                                                                                                                                                                      |
| <b>Study design</b>            | Cross-sectional (large-scale) + experience sampling                                                                                                                                                                          |
| <b>Sample (N)</b>              | 261                                                                                                                                                                                                                          |
| <b>Mean age (SD)</b>           | 25.31                                                                                                                                                                                                                        |
| <b>% Female</b>                | 61% (159/261)                                                                                                                                                                                                                |
| <b>Sample type</b>             | Student (university)                                                                                                                                                                                                         |
| <b>IV / MM measure</b>         | Media Use Questionnaire short form (MMS)                                                                                                                                                                                     |
| <b>IV / SM measure</b>         | -                                                                                                                                                                                                                            |
| <b>DV / Attention</b>          | Change-detection task + mind-wandering probes                                                                                                                                                                                |
| <b>DV / Executive function</b> | Change-detection (WM/filtering)                                                                                                                                                                                              |
| <b>Direction of effect</b>     | Null                                                                                                                                                                                                                         |
| <b>Effect size</b>             | $\chi^2(1)=1.41$ , $p=.236$ , $BF_{01}=2.43$                                                                                                                                                                                 |
| <b>Neural measure</b>          | -                                                                                                                                                                                                                            |
| <b>Key finding</b>             | In this well-powered change-detection study, heavier media multitasking was not reliably related to distractibility, task performance, or mind wandering, and the Bayesian evidence pointed toward the absence of an effect. |

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**Study 5. Fisher et al. (2023)**

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|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Computers in Human Behavior                                                                                                                                                                             |
| <b>Country</b>                 | USA                                                                                                                                                                                                     |
| <b>Study design</b>            | Cross-sectional (network analysis)                                                                                                                                                                      |
| <b>Sample (N)</b>              | 2542 (largest sample)                                                                                                                                                                                   |
| <b>Mean age (SD)</b>           | Young adults (university)                                                                                                                                                                               |
| <b>% Female</b>                | Not reported                                                                                                                                                                                            |
| <b>Sample type</b>             | Student (large university)                                                                                                                                                                              |
| <b>IV / MM measure</b>         | MMI + MMI behavior network                                                                                                                                                                              |
| <b>IV / SM measure</b>         | -                                                                                                                                                                                                       |
| <b>DV / Attention</b>          | Self-reported attention problems (ASRS, ARCES)                                                                                                                                                          |
| <b>DV / Executive function</b> | -                                                                                                                                                                                                       |
| <b>Direction of effect</b>     | Positive (more MM → more attention problems), weak                                                                                                                                                      |
| <b>Effect size</b>             | MMI-ASRS $r=0.20$ ; MMI-ARCES $r=0.24$                                                                                                                                                                  |
| <b>Neural measure</b>          | -                                                                                                                                                                                                       |
| <b>Key finding</b>             | Higher media multitasking related to greater ADHD symptoms and attention failures, but correlations were weak. Mobile apps and music were the media behaviors most strongly tied to attention problems. |

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**Study 6. Shin et al. (2024)**

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|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Behaviour & Information Technology                                                                                                                                                                                      |
| <b>Country</b>                 | Australia (Charles Sturt)                                                                                                                                                                                               |
| <b>Study design</b>            | Cross-sectional (SART + probes)                                                                                                                                                                                         |
| <b>Sample (N)</b>              | 238                                                                                                                                                                                                                     |
| <b>Mean age (SD)</b>           | 35.03 (11.70)                                                                                                                                                                                                           |
| <b>% Female</b>                | 68.5%                                                                                                                                                                                                                   |
| <b>Sample type</b>             | Mixed (students + community)                                                                                                                                                                                            |
| <b>IV / MM measure</b>         | MMI (modified, Ralph et al.)                                                                                                                                                                                            |
| <b>IV / SM measure</b>         | -                                                                                                                                                                                                                       |
| <b>DV / Attention</b>          | SART + mind-wandering probes                                                                                                                                                                                            |
| <b>DV / Executive function</b> | SART commission errors (inhibition)                                                                                                                                                                                     |
| <b>Direction of effect</b>     | Negative (heavier MM → more errors, variability, MW without awareness)                                                                                                                                                  |
| <b>Effect size</b>             | MMI-commission $r=0.230$ ; MMI-MW $r=0.278$ ; MMI-omission $r=0.173$                                                                                                                                                    |
| <b>Neural measure</b>          | -                                                                                                                                                                                                                       |
| <b>Key finding</b>             | Heavier media multitasking linked to more omission/commission errors and response variability on the SART, plus more mind wandering WITHOUT awareness — indicating a more progressed form of attentional disengagement. |

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**Study 7. Rioja et al. (2023)**

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|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Technology, Mind, and Behavior                                                                                                                                                                                                                                                    |
| <b>Country</b>                 | Netherlands + MTurk + Prolific                                                                                                                                                                                                                                                    |
| <b>Study design</b>            | Cross-sectional (multi-sample)                                                                                                                                                                                                                                                    |
| <b>Sample (N)</b>              | 924 (322 MTurk, 304 Prolific, 298 Student)                                                                                                                                                                                                                                        |
| <b>Mean age (SD)</b>           | MTurk:24.73; Prolific:24.42; Student:20.08                                                                                                                                                                                                                                        |
| <b>% Female</b>                | MTurk:37%; Prolific:39%; Student:81%                                                                                                                                                                                                                                              |
| <b>Sample type</b>             | Mixed (3 platforms)                                                                                                                                                                                                                                                               |
| <b>IV / MM measure</b>         | MMI + novel F-MMI (Fisher)                                                                                                                                                                                                                                                        |
| <b>IV / SM measure</b>         | -                                                                                                                                                                                                                                                                                 |
| <b>DV / Attention</b>          | gradCPT (sustained attention) + self-report                                                                                                                                                                                                                                       |
| <b>DV / Executive function</b> | -                                                                                                                                                                                                                                                                                 |
| <b>Direction of effect</b>     | Negative (MM → worse sustained attention, all 3 samples)                                                                                                                                                                                                                          |
| <b>Effect size</b>             | MMI–gradCPT $r=0.21$ ; MMI–self-report $r=0.20$                                                                                                                                                                                                                                   |
| <b>Neural measure</b>          | -                                                                                                                                                                                                                                                                                 |
| <b>Key finding</b>             | Robust negative association between media multitasking and sustained attention replicated across three independent samples ( $r\approx 0.20\text{--}0.21$ ) on both task and self-report measures. Effect strongest in MTurk, weaker but present in Prolific and student samples. |

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**Study 8. Mahakud & Thapliyal (2026)**

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|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Annals of Neurosciences                                                                                                                                                                                                                                          |
| <b>Country</b>                 | India (Delhi)                                                                                                                                                                                                                                                    |
| <b>Study design</b>            | Experimental (multi-group pre/post-test)                                                                                                                                                                                                                         |
| <b>Sample (N)</b>              | 48 (45 med-high users, 3 low)                                                                                                                                                                                                                                    |
| <b>Mean age (SD)</b>           | NR (range 20–25)                                                                                                                                                                                                                                                 |
| <b>% Female</b>                | 52.1%                                                                                                                                                                                                                                                            |
| <b>Sample type</b>             | Community (young adult)                                                                                                                                                                                                                                          |
| <b>IV / MM measure</b>         | Daily SM use classification (<1.5h vs >1.5h)                                                                                                                                                                                                                     |
| <b>IV / SM measure</b>         | Content format exposure: sludge / regular short-video / no-media                                                                                                                                                                                                 |
| <b>DV / Attention</b>          | Continuous Performance Test (CPT — sustained attention)                                                                                                                                                                                                          |
| <b>DV / Executive function</b> | 2-back working memory                                                                                                                                                                                                                                            |
| <b>Direction of effect</b>     | Mixed (sludge → sustained attention DECLINE; NO effect on working memory)                                                                                                                                                                                        |
| <b>Effect size</b>             | Sustained attention: Kruskal-Wallis $H=17.176$ , $p<.001$ ; sludge vs no-media adj. $p<.001$                                                                                                                                                                     |
| <b>Neural measure</b>          | -                                                                                                                                                                                                                                                                |
| <b>Key finding</b>             | Among the video formats compared, the sludge (multi-stream) condition was followed by the steepest drop in sustained-attention performance, while working-memory scores did not differ significantly between the format conditions within the same participants. |

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**Study 9. Wang & Chen (2026)**

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|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Research Papers in Education                                                                                                                                                                                                        |
| <b>Country</b>                 | Taiwan                                                                                                                                                                                                                              |
| <b>Study design</b>            | Cross-sectional (eye-tracking group comparison)                                                                                                                                                                                     |
| <b>Sample (N)</b>              | 46 (high-MM vs low-MM)                                                                                                                                                                                                              |
| <b>Mean age (SD)</b>           | 21.3 (0.50)                                                                                                                                                                                                                         |
| <b>% Female</b>                | 50.0%                                                                                                                                                                                                                               |
| <b>Sample type</b>             | Student (2nd-year undergrad)                                                                                                                                                                                                        |
| <b>IV / MM measure</b>         | Modified MMI (5-point Likert)                                                                                                                                                                                                       |
| <b>IV / SM measure</b>         | -                                                                                                                                                                                                                                   |
| <b>DV / Attention</b>          | Eye-tracking (LFF, DFF, TFD, fixation count, transitions)                                                                                                                                                                           |
| <b>DV / Executive function</b> | None (English vocabulary learning test)                                                                                                                                                                                             |
| <b>Direction of effect</b>     | Negative (high-MM → worse learning performance)                                                                                                                                                                                     |
| <b>Effect size</b>             | Post-test vocab: $Z=-2.876$ , $p=.004$                                                                                                                                                                                              |
| <b>Neural measure</b>          | None (eye-tracking only)                                                                                                                                                                                                            |
| <b>Key finding</b>             | Both groups initially attended to instructional content, but fixation sequences differed. Low-MM group significantly outperformed high-MM group on post-test vocabulary, indicating poorer learning among heavy media multitaskers. |

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**Study 10. Ralph et al. (2014)**

|                                |                                                                                                                                                                                                                                                             |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Psychological Research                                                                                                                                                                                                                                      |
| <b>Country</b>                 | Canada                                                                                                                                                                                                                                                      |
| <b>Study design</b>            | Cross-sectional (online self-report)                                                                                                                                                                                                                        |
| <b>Sample (N)</b>              | 202 recruited (197 analyzed)                                                                                                                                                                                                                                |
| <b>Mean age (SD)</b>           | Not reported                                                                                                                                                                                                                                                |
| <b>% Female</b>                | 72.3%                                                                                                                                                                                                                                                       |
| <b>Sample type</b>             | Student (undergraduate)                                                                                                                                                                                                                                     |
| <b>IV / MM measure</b>         | MMI                                                                                                                                                                                                                                                         |
| <b>IV / SM measure</b>         | -                                                                                                                                                                                                                                                           |
| <b>DV / Attention</b>          | Self-report: MAAS-LO, ARCES, AC-S, AC-D                                                                                                                                                                                                                     |
| <b>DV / Executive function</b> | -                                                                                                                                                                                                                                                           |
| <b>Direction of effect</b>     | Mixed (positive with attention failures/MW; NO relation to switching/distractibility)                                                                                                                                                                       |
| <b>Effect size</b>             | MMI–attention failures $r=.28$ ; MMI–ARCES $r=.28$ ; indirect $b=.17$                                                                                                                                                                                       |
| <b>Neural measure</b>          | -                                                                                                                                                                                                                                                           |
| <b>Key finding</b>             | Higher media multitasking associated with more self-reported attention lapses, attention-related errors, and mind wandering; but NOT with memory failures, perceived switching ability, or environmental distractibility. A foundational self-report study. |

## THEME 2: Core Executive Functions

### Study 11. Colvett et al. (2025)

|                                |                                                                                                                                                                                                                            |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Experimental Psychology                                                                                                                                                                                                    |
| <b>Country</b>                 | USA                                                                                                                                                                                                                        |
| <b>Study design</b>            | Experimental                                                                                                                                                                                                               |
| <b>Sample (N)</b>              | 44 (Exp 1); 68 (Exp 2)                                                                                                                                                                                                     |
| <b>Mean age (SD)</b>           | 19.18 (1.11) / 18.94 (0.93)                                                                                                                                                                                                |
| <b>% Female</b>                | 43.2% / 50%                                                                                                                                                                                                                |
| <b>Sample type</b>             | Student                                                                                                                                                                                                                    |
| <b>IV / MM measure</b>         | MMI + MMES (frequency vs. hours)                                                                                                                                                                                           |
| <b>IV / SM measure</b>         | Not reported                                                                                                                                                                                                               |
| <b>DV / Attention</b>          | -                                                                                                                                                                                                                          |
| <b>DV / Executive function</b> | Task switching, Cued (CTS) and Voluntary (VTS)                                                                                                                                                                             |
| <b>Direction of effect</b>     | Mixed (HMMs < switch costs in CTS; no difference in VTS)                                                                                                                                                                   |
| <b>Effect size</b>             | $\eta^2 = 0.11$ (CTS); $d = 0.23$ (VTS)                                                                                                                                                                                    |
| <b>Neural measure</b>          | -                                                                                                                                                                                                                          |
| <b>Key finding</b>             | Heavy media multitaskers showed smaller switch costs than light multitaskers in externally cued task switching but not voluntary switching, suggesting MM relates specifically to externally guided cognitive flexibility. |

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**Study 12. Pablo et al. (2025)**

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|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Attention, Perception, & Psychophysics                                                                                                                                                                                         |
| <b>Country</b>                 | USA                                                                                                                                                                                                                            |
| <b>Study design</b>            | Experimental (multi-experiment laboratory)                                                                                                                                                                                     |
| <b>Sample (N)</b>              | Exp 1a=71, 1b=31, 1c=25, 2a=65, 2b/2c=77 (same sample)                                                                                                                                                                         |
| <b>Mean age (SD)</b>           | Exp 1a: 20.2 (2.5); 1b: 18.9 (1.6); 1c: 19.4 (2.2); 2a: 19.2 (1.5); 2b/2c: 20.0 (1.7)                                                                                                                                          |
| <b>% Female</b>                | Exp 1a: 68%; 1b: 68%; 1c: 68%; 2a: 60%; 2b/2c: 57%                                                                                                                                                                             |
| <b>Sample type</b>             | Student (undergraduate)                                                                                                                                                                                                        |
| <b>IV / MM measure</b>         | Screen time (verified + estimated); not MMI                                                                                                                                                                                    |
| <b>IV / SM measure</b>         | -                                                                                                                                                                                                                              |
| <b>DV / Attention</b>          | Change detection, visual/auditory sequential tasks                                                                                                                                                                             |
| <b>DV / Executive function</b> | N-back (visual + auditory), change detection                                                                                                                                                                                   |
| <b>Direction of effect</b>     | Null (all experiments)                                                                                                                                                                                                         |
| <b>Effect size</b>             | Correlations near zero; Bayes factors indicated anecdotal to moderate evidence for the null hypothesis                                                                                                                         |
| <b>Neural measure</b>          | -                                                                                                                                                                                                                              |
| <b>Key finding</b>             | Across the six experimental datasets, neither verified nor estimated media-use duration showed a reliable association with working-memory performance; Bayesian analyses favoured the null across task types and both cohorts. |

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**Study 13. Müller et al. (2021)**

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|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Cognitive Processing                                                                                                                                                                                                                           |
| <b>Country</b>                 | Germany (Duisburg-Essen)                                                                                                                                                                                                                       |
| <b>Study design</b>            | Cross-sectional (lab group comparison)                                                                                                                                                                                                         |
| <b>Sample (N)</b>              | 44 lab (19 LMM, 25 HMM); 182 online screening                                                                                                                                                                                                  |
| <b>Mean age (SD)</b>           | Total: 22.44 (8.04); LMM: 26.37; HMM: 19.52                                                                                                                                                                                                    |
| <b>% Female</b>                | 81.8%                                                                                                                                                                                                                                          |
| <b>Sample type</b>             | Community (advertisements)                                                                                                                                                                                                                     |
| <b>IV / MM measure</b>         | Adapted MMI (HMM vs LMM)                                                                                                                                                                                                                       |
| <b>IV / SM measure</b>         | s-IAT (problematic Internet use)                                                                                                                                                                                                               |
| <b>DV / Attention</b>          | ARCES (attention errors, self-report)                                                                                                                                                                                                          |
| <b>DV / Executive function</b> | Modified Card Sorting, TMT, Stroop, backward Digit Span, IGT, Game of Dice                                                                                                                                                                     |
| <b>Direction of effect</b>     | Mixed (HMM worse on IGT, fluid IQ, WM; NO diff on general EF tasks or objective-risk)                                                                                                                                                          |
| <b>Effect size</b>             | IGT $\eta^2=0.139$ ; fluid IQ $\eta^2=0.125$ ; backward digit span $\eta^2=0.098$                                                                                                                                                              |
| <b>Neural measure</b>          | -                                                                                                                                                                                                                                              |
| <b>Key finding</b>             | HMMs performed worse than LMMs on the Iowa Gambling Task (learning trials), fluid intelligence, and working memory, but showed NO significant differences on general executive-function tasks, impulsivity, or objective-risk decision-making. |

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**Study 14. Murphy et al. (2017)**

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|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Computers in Human Behavior                                                                                                                                                                                         |
| <b>Country</b>                 | Australia                                                                                                                                                                                                           |
| <b>Study design</b>            | Cross-sectional (group comparison + load manipulation)                                                                                                                                                              |
| <b>Sample (N)</b>              | 85 (28 LMM, 29 AMM, 28 HMM)                                                                                                                                                                                         |
| <b>Mean age (SD)</b>           | 22.72 (6.05)                                                                                                                                                                                                        |
| <b>% Female</b>                | 76.5%                                                                                                                                                                                                               |
| <b>Sample type</b>             | Student (undergraduate)                                                                                                                                                                                             |
| <b>IV / MM measure</b>         | MMI (LMM/AMM/HMM classification)                                                                                                                                                                                    |
| <b>IV / SM measure</b>         | -                                                                                                                                                                                                                   |
| <b>DV / Attention</b>          | Flanker (filtering, low/high load)                                                                                                                                                                                  |
| <b>DV / Executive function</b> | Go/No-Go (response inhibition)                                                                                                                                                                                      |
| <b>Direction of effect</b>     | Mixed/non-linear (NO flanker group diff; AMM worse inhibition than LMM & HMM under high load)                                                                                                                       |
| <b>Effect size</b>             | High-load: AMM vs LMM $d=.62$ ; AMM vs HMM $d=.55$                                                                                                                                                                  |
| <b>Neural measure</b>          | -                                                                                                                                                                                                                   |
| <b>Key finding</b>             | No media-group differences on flanker filtering. Under high perceptual load, AVERAGE media multitaskers made more No-Go errors than both light and heavy multitaskers; an unexpected non-linear (U-shaped) pattern. |

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**Study 15. Seddon et al. (2018)**

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|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Journal of Cognitive Psychology                                                                                                                                                                                     |
| <b>Country</b>                 | UK                                                                                                                                                                                                                  |
| <b>Study design</b>            | Cross-sectional (correlational)                                                                                                                                                                                     |
| <b>Sample (N)</b>              | 112 recruited (105 analyzed)                                                                                                                                                                                        |
| <b>Mean age (SD)</b>           | 20.83 (2.12)                                                                                                                                                                                                        |
| <b>% Female</b>                | 67.9%                                                                                                                                                                                                               |
| <b>Sample type</b>             | Mixed (students + public)                                                                                                                                                                                           |
| <b>IV / MM measure</b>         | Adapted MMI                                                                                                                                                                                                         |
| <b>IV / SM measure</b>         | -                                                                                                                                                                                                                   |
| <b>DV / Attention</b>          | Number/Arrow Flanker, Go/No-Go (attentional inhibition)                                                                                                                                                             |
| <b>DV / Executive function</b> | 10-task EF battery (SSRT, Go/No-Go, Flanker, fluency, WCST, TMT, backward digit span, backward Corsi)                                                                                                               |
| <b>Direction of effect</b>     | Null for EF; positive MMI–trait anxiety                                                                                                                                                                             |
| <b>Effect size</b>             | No significant MMI–EF effects after correction                                                                                                                                                                      |
| <b>Neural measure</b>          | -                                                                                                                                                                                                                   |
| <b>Key finding</b>             | Across a ten-task battery spanning inhibition, working memory, and flexibility, self-reported media multitasking predicted none of the executive measures reliably; the only variable it tracked was trait anxiety. |

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**Study 16. Seddon et al. (2025)**

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|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Journal of Cognitive Psychology                                                                                                                                                                                                                                |
| <b>Country</b>                 | UK                                                                                                                                                                                                                                                             |
| <b>Study design</b>            | Experimental (RCT, 2×2 mixed pre/post)                                                                                                                                                                                                                         |
| <b>Sample (N)</b>              | 76 (38 sequential, 38 simultaneous)                                                                                                                                                                                                                            |
| <b>Mean age (SD)</b>           | 21.38 (2.10)                                                                                                                                                                                                                                                   |
| <b>% Female</b>                | 67.1%                                                                                                                                                                                                                                                          |
| <b>Sample type</b>             | Mixed (university + public)                                                                                                                                                                                                                                    |
| <b>IV / MM measure</b>         | Experimental MM manipulation (simultaneous video+text vs sequential)                                                                                                                                                                                           |
| <b>IV / SM measure</b>         | -                                                                                                                                                                                                                                                              |
| <b>DV / Attention</b>          | Flanker, Go/No-Go (attentional control)                                                                                                                                                                                                                        |
| <b>DV / Executive function</b> | Flanker, Go/No-Go, backward digit span, backward Corsi, TMT, fluency                                                                                                                                                                                           |
| <b>Direction of effect</b>     | Null (MM did NOT cause greater EF decline than sequential)                                                                                                                                                                                                     |
| <b>Effect size</b>             | Interaction $\eta^2 < .001$ to .021 (trivial–small)                                                                                                                                                                                                            |
| <b>Neural measure</b>          | -                                                                                                                                                                                                                                                              |
| <b>Key finding</b>             | No significant time-by-group interactions: media multitasking did NOT produce greater post-task EF decline than sequential media use, across working memory, inhibition, and flexibility. Mood worsened in both groups. Experimental confirmation of the null. |

### THEME 3: Problematic Social Media Use & Executive Functions

#### Study 17. Cudo et al. (2023)

|                                |                                                                                                                                                                       |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Psychological Research                                                                                                                                                |
| <b>Country</b>                 | Poland                                                                                                                                                                |
| <b>Study design</b>            | Experimental (quasi-experimental)                                                                                                                                     |
| <b>Sample (N)</b>              | 82                                                                                                                                                                    |
| <b>Mean age (SD)</b>           | 22.24 (2.67)                                                                                                                                                          |
| <b>% Female</b>                | 69.5%                                                                                                                                                                 |
| <b>Sample type</b>             | Student                                                                                                                                                               |
| <b>IV / MM measure</b>         | Not reported                                                                                                                                                          |
| <b>IV / SM measure</b>         | Facebook Intrusion Scale (FIS); PSMU proxy                                                                                                                            |
| <b>DV / Attention</b>          | AX-CPT (reactive/proactive control)                                                                                                                                   |
| <b>DV / Executive function</b> | None (AX-CPT = cognitive control)                                                                                                                                     |
| <b>Direction of effect</b>     | Negative (high FIS → lower proactive control)                                                                                                                         |
| <b>Effect size</b>             | $\eta^2 = 0.06$                                                                                                                                                       |
| <b>Neural measure</b>          | -                                                                                                                                                                     |
| <b>Key finding</b>             | High Facebook intrusion associated with greater reactive and deficits in proactive cognitive control, especially in Facebook-related and positive emotional contexts. |

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**Study 18. Arness & Ollis (2023)**

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|                                |                                                                                                                                                                                      |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Current Psychology                                                                                                                                                                   |
| <b>Country</b>                 | Australia                                                                                                                                                                            |
| <b>Study design</b>            | Mixed-methods (SEM + qualitative)                                                                                                                                                    |
| <b>Sample (N)</b>              | 607 (quant) + 24 (qual)                                                                                                                                                              |
| <b>Mean age (SD)</b>           | 22.02 (range 17–58)                                                                                                                                                                  |
| <b>% Female</b>                | Predominantly female                                                                                                                                                                 |
| <b>Sample type</b>             | Student (university)                                                                                                                                                                 |
| <b>IV / MM measure</b>         | Not reported                                                                                                                                                                         |
| <b>IV / SM measure</b>         | BSMAS + social media use motives (impulsive/engaged/social)                                                                                                                          |
| <b>DV / Attention</b>          | -                                                                                                                                                                                    |
| <b>DV / Executive function</b> | Adult ADHD Self-Report Scale (ASRS), attention dysregulation                                                                                                                         |
| <b>Direction of effect</b>     | Positive indirect (poorer attention → PSMU via impulsive use)                                                                                                                        |
| <b>Effect size</b>             | ASRS–BSMAS $r = 0.64$                                                                                                                                                                |
| <b>Neural measure</b>          | -                                                                                                                                                                                    |
| <b>Key finding</b>             | In a structural model, attention dysregulation was linked to problematic use primarily via impulsive and habitual patterns of engagement rather than through frequency of use alone. |

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**Study 19. Reed (2023)**

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|                                |                                                                                                                                                                                                                       |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Computers in Human Behavior                                                                                                                                                                                           |
| <b>Country</b>                 | UK                                                                                                                                                                                                                    |
| <b>Study design</b>            | Experimental (multiple experiments)                                                                                                                                                                                   |
| <b>Sample (N)</b>              | Exp1:378; Exp2:160; Exp3:347                                                                                                                                                                                          |
| <b>Mean age (SD)</b>           | Exp1:28.56(12.72); Exp2:21.05(1.76); Exp3:25.13(3.81)                                                                                                                                                                 |
| <b>% Female</b>                | 55–71%                                                                                                                                                                                                                |
| <b>Sample type</b>             | Mixed (online + subject pool)                                                                                                                                                                                         |
| <b>IV / MM measure</b>         | Not reported                                                                                                                                                                                                          |
| <b>IV / SM measure</b>         | BSMAS + SMAS (general use + PSMU)                                                                                                                                                                                     |
| <b>DV / Attention</b>          | Colour-Stroop                                                                                                                                                                                                         |
| <b>DV / Executive function</b> | WCST + Iowa Gambling Task + Go/No-Go                                                                                                                                                                                  |
| <b>Direction of effect</b>     | Mixed / cue-specific (null on WCST & Stroop; positive on IGT + SM-related NoGo)                                                                                                                                       |
| <b>Effect size</b>             | SMA–IGT $r=0.196$ ; SMA–NoGo(SM) $r=0.369$                                                                                                                                                                            |
| <b>Neural measure</b>          | -                                                                                                                                                                                                                     |
| <b>Key finding</b>             | Social media addiction related to greater IGT impulsivity and more inhibition errors on social-media-related NoGo trials, but NOT on neutral tasks. Cognitive deficits in SMA appear cue-specific rather than global. |

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**Study 20. Golding et al. (2025)**

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|                                |                                                                                                                                                                                                                                                                                                    |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Behavioral Sciences                                                                                                                                                                                                                                                                                |
| <b>Country</b>                 | USA (UC Riverside)                                                                                                                                                                                                                                                                                 |
| <b>Study design</b>            | Cross-sectional (survey)                                                                                                                                                                                                                                                                           |
| <b>Sample (N)</b>              | 346                                                                                                                                                                                                                                                                                                |
| <b>Mean age (SD)</b>           | 19.90 (2.66)                                                                                                                                                                                                                                                                                       |
| <b>% Female</b>                | 57.2%                                                                                                                                                                                                                                                                                              |
| <b>Sample type</b>             | Student                                                                                                                                                                                                                                                                                            |
| <b>IV / MM measure</b>         | Not reported                                                                                                                                                                                                                                                                                       |
| <b>IV / SM measure</b>         | TikTok Intensity (TTI) + PSMU                                                                                                                                                                                                                                                                      |
| <b>DV / Attention</b>          | -                                                                                                                                                                                                                                                                                                  |
| <b>DV / Executive function</b> | BRIEF-A (self-report EF, 75 items)                                                                                                                                                                                                                                                                 |
| <b>Direction of effect</b>     | Negative but TikTok→EF FULLY mediated by PSMU                                                                                                                                                                                                                                                      |
| <b>Effect size</b>             | TikTok–EF $r=0.21$ ; PSMU–EF $r=0.34$                                                                                                                                                                                                                                                              |
| <b>Neural measure</b>          | -                                                                                                                                                                                                                                                                                                  |
| <b>Key finding</b>             | The link between TikTok use intensity and weaker executive functioning operated entirely through problematic social media use in a survey-based statistical mediation; once problematic use and mental-health covariates were accounted for, platform time no longer predicted executive outcomes. |

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**Study 21. Shannon et al. (2025)**

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|                                |                                                                                                                                                                                                                                                    |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Addictive Behaviors                                                                                                                                                                                                                                |
| <b>Country</b>                 | Canada (Carleton)                                                                                                                                                                                                                                  |
| <b>Study design</b>            | Cross-sectional (survey + behavioral tasks)                                                                                                                                                                                                        |
| <b>Sample (N)</b>              | 503                                                                                                                                                                                                                                                |
| <b>Mean age (SD)</b>           | NR (range 17–33)                                                                                                                                                                                                                                   |
| <b>% Female</b>                | 66.6%                                                                                                                                                                                                                                              |
| <b>Sample type</b>             | Student (undergraduate)                                                                                                                                                                                                                            |
| <b>IV / MM measure</b>         | Not reported                                                                                                                                                                                                                                       |
| <b>IV / SM measure</b>         | BSMAS (PSMU)                                                                                                                                                                                                                                       |
| <b>DV / Attention</b>          | Go/No-Go (motor inhibition)                                                                                                                                                                                                                        |
| <b>DV / Executive function</b> | Go/No-Go + Iowa Gambling Task                                                                                                                                                                                                                      |
| <b>Direction of effect</b>     | Mixed (PSMU → impulsivity YES; PSMU → Go/No-Go & IGT performance NO)                                                                                                                                                                               |
| <b>Effect size</b>             | Attentional impulsivity $r=0.26$ ; cognitive instability $r=0.25$ ; $R^2=0.12 \rightarrow 0.36$                                                                                                                                                    |
| <b>Neural measure</b>          | -                                                                                                                                                                                                                                                  |
| <b>Key finding</b>             | Higher PSMU related to greater trait impulsivity (especially attentional impulsivity, cognitive instability) but NOT to behavioral inhibitory-control performance on Go/No-Go or IGT. Cognitive impulsivity may matter more than motor inhibition. |

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**Study 22. Kahya et al. (2025)**

|                                |                                                                                                                                                                                                    |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Addicta: Turkish Journal on Addictions                                                                                                                                                             |
| <b>Country</b>                 | Türkiye                                                                                                                                                                                            |
| <b>Study design</b>            | Cross-sectional (survey)                                                                                                                                                                           |
| <b>Sample (N)</b>              | 174 (236 enrolled)                                                                                                                                                                                 |
| <b>Mean age (SD)</b>           | 37.19 (9.17)                                                                                                                                                                                       |
| <b>% Female</b>                | 62.6%                                                                                                                                                                                              |
| <b>Sample type</b>             | Community (adult)                                                                                                                                                                                  |
| <b>IV / MM measure</b>         | Not reported                                                                                                                                                                                       |
| <b>IV / SM measure</b>         | BSMAS (PSMU)                                                                                                                                                                                       |
| <b>DV / Attention</b>          | -                                                                                                                                                                                                  |
| <b>DV / Executive function</b> | Executive Function Index (EFI; self-report)                                                                                                                                                        |
| <b>Direction of effect</b>     | Mixed (PSMU → lower organization; PSMU → higher depression/anxiety/stress)                                                                                                                         |
| <b>Effect size</b>             | Organization $r=-0.42$ ; depression $r=0.35$ ; anxiety $r=0.21$ ; stress $r=0.23$                                                                                                                  |
| <b>Neural measure</b>          | -                                                                                                                                                                                                  |
| <b>Key finding</b>             | Higher PSMU associated with poorer executive functioning, particularly lower organizational ability, and with greater depression, anxiety, and stress. Sleep quality relationship non-significant. |

## THEME 4: Neurobiological Correlates

### Study 23. Su et al. (2021)

|                                |                                                                                                                                                                                                  |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | NeuroImage                                                                                                                                                                                       |
| <b>Country</b>                 | China                                                                                                                                                                                            |
| <b>Study design</b>            | Neuroimaging (fMRI) + Survey                                                                                                                                                                     |
| <b>Sample (N)</b>              | 208 (survey); 30 (fMRI). Survey sample aged 17–31; fMRI subsample aged 19–30.                                                                                                                    |
| <b>Mean age (SD)</b>           | 22.8 (3.14) / 23.73 (2.38)                                                                                                                                                                       |
| <b>% Female</b>                | 59.5% / 46.7%                                                                                                                                                                                    |
| <b>Sample type</b>             | Student                                                                                                                                                                                          |
| <b>IV / MM measure</b>         | Not reported                                                                                                                                                                                     |
| <b>IV / SM measure</b>         | Problematic TikTok Use Scale (PTU)                                                                                                                                                               |
| <b>DV / Attention</b>          | -                                                                                                                                                                                                |
| <b>DV / Executive function</b> | Brief Self-Control Scale (SCS)                                                                                                                                                                   |
| <b>Direction of effect</b>     | Negative                                                                                                                                                                                         |
| <b>Effect size</b>             | $r = -0.279$                                                                                                                                                                                     |
| <b>Neural measure</b>          | fMRI                                                                                                                                                                                             |
| <b>Key finding</b>             | Problematic TikTok use negatively correlated with self-control. Personalized video recommendations activate DMN (dMPFC) and VTA, suggesting neural basis for addiction-like engagement patterns. |

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**Study 24. Walla & Zheng (2024)**

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|                                |                                                                                                                                                                                             |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Life                                                                                                                                                                                        |
| <b>Country</b>                 | NR (lab ERP study)                                                                                                                                                                          |
| <b>Study design</b>            | Experimental (ERP, cross-sectional)                                                                                                                                                         |
| <b>Sample (N)</b>              | 29 (14 heavy, 15 regular)                                                                                                                                                                   |
| <b>Mean age (SD)</b>           | Heavy: 21.07; Regular: 21.87                                                                                                                                                                |
| <b>% Female</b>                | Not reported                                                                                                                                                                                |
| <b>Sample type</b>             | Community (short-video users)                                                                                                                                                               |
| <b>IV / MM measure</b>         | Not reported                                                                                                                                                                                |
| <b>IV / SM measure</b>         | Self-reported short-video SM use (>4h/day heavy vs <3h/day regular)                                                                                                                         |
| <b>DV / Attention</b>          | Visual oddball task (P300 ERP)                                                                                                                                                              |
| <b>DV / Executive function</b> | -                                                                                                                                                                                           |
| <b>Direction of effect</b>     | Negative (heavy users → reduced P300)                                                                                                                                                       |
| <b>Effect size</b>             | Group effect 340–360ms window                                                                                                                                                               |
| <b>Neural measure</b>          | EEG (P300 ERP)                                                                                                                                                                              |
| <b>Key finding</b>             | Heavy short-video social media users showed significantly reduced P300 amplitude in a visual oddball task, indicating weaker attention-related neural processing compared to regular users. |

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**Study 25. Zhang et al. (2022)**

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|                                |                                                                                                                                                                                                                         |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Computers in Human Behavior                                                                                                                                                                                             |
| <b>Country</b>                 | China (Hebei)                                                                                                                                                                                                           |
| <b>Study design</b>            | Experimental (behavioral + ERP)                                                                                                                                                                                         |
| <b>Sample (N)</b>              | 106 questionnaire + ERP subset                                                                                                                                                                                          |
| <b>Mean age (SD)</b>           | NR (HMM/LMM groups)                                                                                                                                                                                                     |
| <b>% Female</b>                | Not reported                                                                                                                                                                                                            |
| <b>Sample type</b>             | Student (university)                                                                                                                                                                                                    |
| <b>IV / MM measure</b>         | Chinese Media Use Questionnaire (HMM vs LMM)                                                                                                                                                                            |
| <b>IV / SM measure</b>         | -                                                                                                                                                                                                                       |
| <b>DV / Attention</b>          | -                                                                                                                                                                                                                       |
| <b>DV / Executive function</b> | Prospective memory task (ERP)                                                                                                                                                                                           |
| <b>Direction of effect</b>     | Mixed (HMM faster RT but more effortful neural strategy)                                                                                                                                                                |
| <b>Effect size</b>             | HMM faster RT; larger ongoing-trial ERP amplitudes                                                                                                                                                                      |
| <b>Neural measure</b>          | EEG (ERP)                                                                                                                                                                                                               |
| <b>Key finding</b>             | The two multitasking groups reached similar prospective-memory accuracy, but heavier multitaskers appeared to recruit greater monitoring-related neural resources to do so, a profile the authors read as compensatory. |

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**Study 26. Aitken et al. (2025)**

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|                                |                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Scientific Reports                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Country</b>                 | USA (Stanford)                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Study design</b>            | Neuroimaging (fNIRS) + Experimental                                                                                                                                                                                                                                                                                                                                                |
| <b>Sample (N)</b>              | 20                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Mean age (SD)</b>           | 21.78 (1.15)                                                                                                                                                                                                                                                                                                                                                                       |
| <b>% Female</b>                | 55%                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Sample type</b>             | Student                                                                                                                                                                                                                                                                                                                                                                            |
| <b>IV / MM measure</b>         | Not reported                                                                                                                                                                                                                                                                                                                                                                       |
| <b>IV / SM measure</b>         | Platform-specific (Instagram 15-min passive scroll) + SMAS                                                                                                                                                                                                                                                                                                                         |
| <b>DV / Attention</b>          | -                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>DV / Executive function</b> | N-back + Go/No-Go                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Direction of effect</b>     | Mixed: significant reduction in Go/No-Go performance; non-significant but directionally negative n-back change                                                                                                                                                                                                                                                                     |
| <b>Effect size</b>             | Go/No-Go: rank-biserial $r = -.66$ , $p_{adj} = .012$ ; n-back: rank-biserial $r = -.55$ , $p_{adj} = .17$                                                                                                                                                                                                                                                                         |
| <b>Neural measure</b>          | fNIRS                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Key finding</b>             | A 15-minute passive Instagram exposure was followed by a significant reduction in Go/No-Go performance; the n-back change-score comparison was not statistically significant ( $p_{adj} = .17$ ) but was directionally negative. fNIRS showed increased mPFC activation (greater effort) and decreased dlPFC/vlPFC activation (impaired WM and inhibition) after social media use. |

**Study 27. Kobayashi et al. (2020)**

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|                                |                                                                                                                                                                                                                                                      |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Scientific Reports                                                                                                                                                                                                                                   |
| <b>Country</b>                 | Japan                                                                                                                                                                                                                                                |
| <b>Study design</b>            | Neuroimaging (resting + task fMRI)                                                                                                                                                                                                                   |
| <b>Sample (N)</b>              | 103 (98 complete data)                                                                                                                                                                                                                               |
| <b>Mean age (SD)</b>           | 29.0 (11.6)                                                                                                                                                                                                                                          |
| <b>% Female</b>                | 35.9%                                                                                                                                                                                                                                                |
| <b>Sample type</b>             | Community (healthy adults)                                                                                                                                                                                                                           |
| <b>IV / MM measure</b>         | MMI (modified Japanese MMQ)                                                                                                                                                                                                                          |
| <b>IV / SM measure</b>         | -                                                                                                                                                                                                                                                    |
| <b>DV / Attention</b>          | Visual CPT + auditory oddball                                                                                                                                                                                                                        |
| <b>DV / Executive function</b> | -                                                                                                                                                                                                                                                    |
| <b>Direction of effect</b>     | Mixed (behavioral attention NOT related to MMI; MMI→DAN degree centrality YES)                                                                                                                                                                       |
| <b>Effect size</b>             | MMI–DAN centrality $\rho=0.23$ , $p=.02$                                                                                                                                                                                                             |
| <b>Neural measure</b>          | fMRI (graph-theory connectivity)                                                                                                                                                                                                                     |
| <b>Key finding</b>             | Higher MMI associated with greater degree centrality in the dorsal attention network during the oddball task, but MMI was NOT significantly related to CPT or behavioral attention performance. So the neural finding needs cautious interpretation. |

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**Study 28. Madore et al. (2020)**

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|                                |                                                                                                                                                                                                                             |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Journal</b>                 | Nature                                                                                                                                                                                                                      |
| <b>Country</b>                 | USA (Stanford)                                                                                                                                                                                                              |
| <b>Study design</b>            | Cross-sectional (EEG + pupillometry + memory)                                                                                                                                                                               |
| <b>Sample (N)</b>              | 80 (smaller for some EEG)                                                                                                                                                                                                   |
| <b>Mean age (SD)</b>           | 21.70 (1.48)                                                                                                                                                                                                                |
| <b>% Female</b>                | 61.3%                                                                                                                                                                                                                       |
| <b>Sample type</b>             | Mixed (students + community)                                                                                                                                                                                                |
| <b>IV / MM measure</b>         | Modified Media Multitasking Inventory                                                                                                                                                                                       |
| <b>IV / SM measure</b>         | -                                                                                                                                                                                                                           |
| <b>DV / Attention</b>          | gradCPT (commission errors, RT variability) + alpha power + pupil variability                                                                                                                                               |
| <b>DV / Executive function</b> | None (episodic memory retrieval primary)                                                                                                                                                                                    |
| <b>Direction of effect</b>     | Negative                                                                                                                                                                                                                    |
| <b>Effect size</b>             | MMT–memory $r=-.28$ to $-.32$ ; MMT–commission $r=.31$ ; MMT–RT var $r=.30$                                                                                                                                                 |
| <b>Neural measure</b>          | EEG + pupillometry                                                                                                                                                                                                          |
| <b>Key finding</b>             | Heavier media multitasking associated with poorer episodic memory and greater sustained-attention lapsing. Trait-level attention lapses partially mediated the MMT–memory relationship, positioning lapsing as a mechanism. |

## APPENDIX B

### Full Database Search Strategies

This appendix presents the complete search strings applied in each database, together with the filters, search dates, and record counts. The searches were run in June 2026. Terms within each conceptual cluster were combined with OR, and the three clusters were combined with AND. Figure 1A in Chapter 2 presents the conceptual structure of these searches.

*Records retrieved: Scopus (n = 920) + PubMed (n = 325) = 1,245 database records; 2 additional records via supplementary hand searching; 1,247 total. After screening, 28 empirical studies were included.*

#### B.1 Scopus

*Search date: June 2026 | Records retrieved: 920 | Filters: PUBYEAR 2010–2025; English; document type = article; subject area = PSYC OR NEUR*

```
TITLE-ABS-KEY (
    ( "media multitasking" OR "media multi-tasking" OR "digital
multitasking"
    OR "social media use" OR "social media" OR "problematic social
media" )
    AND
    ( "attention" OR "attentional control" OR "sustained attention"
    OR "executive function*" OR "cognitive control" OR "inhibitory
control"
    OR "working memory" OR "cognitive flexibility" )
    AND
    ( "adult*" OR "young adult*" OR "university student*" OR "college
student*" )
)
AND ( LIMIT-TO ( PUBYEAR , 2010-2025 ) )
AND ( LIMIT-TO ( LANGUAGE , "English" ) )
AND ( LIMIT-TO ( DOCTYPE , "ar" ) )
AND ( LIMIT-TO ( SUBJAREA , "PSYC" ) OR LIMIT-TO ( SUBJAREA , "NEUR" ) )
```

## B.2 PubMed / MEDLINE

*Search date: June 2026 | Records retrieved: 325 | Filters: 2010–2025; English; Humans [MeSH]*

```
(  
  ("media multitasking"[tiab] OR "media multi-tasking"[tiab]  
  OR "digital multitasking"[tiab] OR "social media"[tiab]  
  OR "social media use"[tiab] OR "problematic social media"[tiab])  
  AND  
  ("attention"[tiab] OR "attentional control"[tiab]  
  OR "sustained attention"[tiab] OR "executive function"[tiab]  
  OR "executive functions"[tiab] OR "cognitive control"[tiab]  
  OR "inhibitory control"[tiab] OR "working memory"[tiab]  
  OR "cognitive flexibility"[tiab])  
  AND  
  ("adult"[tiab] OR "adults"[tiab] OR "young adult"[tiab]  
  OR "university student*"[tiab] OR "college student*"[tiab])  
)  
AND ("2010"[dp] : "2025"[dp])  
AND English[lang]  
AND Humans[MeSH Terms]
```

## B.3 Supplementary Hand Searching

After the database searches were completed, two articles published online in early 2026 (Mahakud & Thapliyal, 2026; Wang & Chen, 2026) were identified through supplementary hand searching conducted in June 2026. This involved screening the recent tables of contents of journals that had already contributed included studies (Annals of Neurosciences and Research Papers in Education among them) and the reference lists of the included studies. Both records were checked against the full eligibility criteria before being

added, and no other records were identified through this process, bringing the total to 1,247 records.

*Note. The search strings above are presented in the syntax appropriate to each database interface. Minor interface-level adjustments (for example, field-tag placement) may be required to reproduce the searches exactly, but the conceptual logic and term sets are as shown.*

## APPENDIX C

### Data Extraction Form Template

The following template was used to extract data from each of the 28 included studies. It was developed for this review and pilot-tested on five randomly selected studies before full extraction. The completed extraction for all studies appears in Appendix A.

| Data Extraction Form — Field Template |                                                                       |
|---------------------------------------|-----------------------------------------------------------------------|
| Author(s) and year                    | Full author list and publication year                                 |
| Country                               | Country of data collection                                            |
| Journal                               | Publishing journal                                                    |
| Study design                          | Cross-sectional, experimental, longitudinal, or neuroimaging          |
| Sample size (N)                       | Total N, and subgroup Ns where applicable                             |
| Mean age (SD)                         | Mean and standard deviation of participant age                        |
| Gender distribution                   | Percentage female or full breakdown                                   |
| Sample type                           | Student, community, mixed, or clinical                                |
| Media-use measure                     | MMI variant, PSMU scale, or platform-specific measure; scoring method |
| Cognitive outcome measure             | Attention and/or executive function task or questionnaire             |
| Main result                           | Direction and nature of the principal finding                         |
| Effect size                           | $r$ , $d$ , $\eta^2$ , or Bayes factor, if reported (otherwise NR)    |
| Neural measure                        | fMRI, EEG/ERP, fNIRS, or none; region or component                    |
| Study limitation                      | Limitations acknowledged by the study authors                         |
| Theme allocation                      | Primary thematic cluster (1–4)                                        |