

Chapter # 34

HOW DO STUDENTS MANAGE CHALLENGING STUDY TASKS?

A Thematic Analysis of Higher Education Students' (Non-)Strategic Study-related Behaviors*

Diane Marcia Manuhuwa^{1,*}, Simone Hanegraaff¹, Johanna Schönrock-Adema², Sjoerd J. de Vries⁴, Jan Willem de Graaf³, & Joke Fleer⁴

¹Saxion University of Applied Sciences, School of Applied Psychology and (International) Human Resource Management, Program Employability Transition, Section Inclusive Society, Deventer, the Netherlands

²University Medical Center Groningen and University of Groningen, Groningen, the Netherlands and Prins Claus Conservatoire, Hanze University of Applied Sciences, Groningen, the Netherlands

³Saxion University of Applied Sciences, School of Applied Psychology and (International) Human Resource Management, Program Employability Transition, Section Inclusive Society, Deventer, the Netherlands

⁴University of Groningen, University Medical Center Groningen, Department of Health Sciences, Section Health Psychology, the Netherlands

ABSTRACT

Higher education presents students with numerous challenges, requiring effective use of executive functions (EFs) to navigate academic demands. EFs are higher-order cognitive processes that regulate thinking, behavior, and emotions for goal-directed and adaptive actions. While strategic behaviors can optimize EFs, students also adopt routines or habits (non-strategic behaviors) to manage study tasks. This study explores students' (non-)strategic behaviors and which EF they predominantly support. Twenty-three students (aged 17-26) were interviewed at a Dutch University of Applied Sciences. Subsequently, we identified 27 themes and 89 types of (non-)strategic behaviors linked to nine EFs through inductive and deductive thematic analyses. The findings provide insights into which specific (non-)strategic behaviors support EFs. This helps students and educators identify behaviors that can strengthen particular EFs, especially those that may be underdeveloped and offers input for guidance for more targeted educational interventions to improve learning and studying.

Keywords: challenging study tasks, executive functions, higher education, study-related strategies, thematic analysis.

1. INTRODUCTION

Students entering higher education encounter numerous challenges, including new learning methods and increasingly complex subject matter, compounded by performance pressures such as exams (Meltzer, Greschler, Davis, & Vanderberg, 2021). These challenges require students to employ strategies to overcome them, activating their executive functions (EFs). EFs encompass higher-order neurocognitive processes involved in the top-down control of behavior, emotion, and cognition (e.g., Diamond, 2013; Nigg, 2017). This study explores students' strategic and non-strategic behaviors, supporting their EFs.

2. BACKGROUND

Executive functions (EFs) include inhibition, working memory, cognitive flexibility, planning, organizing, and initiation (e.g., Baggetta & Alexander, 2016; Gioia, Isquith, Guy, & Kenworthy, 2000). EFs are cognitive processes primarily employed at the onset of new situations that require knowledge acquisition or skill rehearsal (Naglieri & Otero, 2014). Consequently, EFs and learning are closely intertwined, as evidenced by their relationship with self-regulated learning (Garner, 2009; Musso, Boekaerts, Segers, & Cascallar, 2019; Pinochet-Quiroz et al., 2022) and academic success (Baars et al., 2015; Denckla & Mahone, 2018; Manuhuwa, Snel-De Boer, Jaarsma, Fleeer, & De Graaf, 2023). While deficiencies in EFs can make it harder to tackle challenging study tasks, the right interventions can help overcome these difficulties (Zelazo, 2015).

Students can support their EF by employing strategies or 'strategic behaviors'. Strategic behaviors are effortful, goal-directed actions using knowledge and skills stored in long-term memory (Van Meter & Campbell, 2020). Strategic behaviors supporting EFs – 'EF strategic behaviors' - in education include for instance, behaviors to support and access working memory, such as note-taking or remembering to bring necessary material from school to home (Meltzer et al., 2021).

EF strategic behaviors are learned and developed implicitly, through daily life experiences, and explicitly, through formal education. For instance, students might learn problem-solving skills implicitly from parents or explicitly from teachers who, in their own ways, both encourage independent thinking and perseverance (Barkley, 2012). Research shows that explicitly teaching students EF strategic behaviors is beneficial across all educational levels, including higher education (e.g., De Boer, Donker, Kostons, & Van der Werf, 2018; Diamond, 2014; Meltzer et al., 2021). EF strategy use broadly correlates with overall academic success (e.g., Meltzer et al., 2021; Sebesta & Speth, 2017). They help students learn more effectively and increase their ability to adapt strategies to match specific task demands (Schneider, 2010). While the importance of explicit strategy instruction in education is recognized, consistent and systematic implementation remains a challenge across educational contexts (e.g., Draper & Cevalco-Trotter, 2023; Meltzer et al., 2021).

Students also adopt behaviors supporting their EFs that are not considered strategic, as they lack goal-directed actions or significant effort. Examples include actions such as drinking coffee to stay alert, taking walking breaks, or setting reminders in a planner. While sometimes purposeful, these behaviors require minimal effort and complexity. In this study, we refer to such behaviors as 'non-strategic' behaviors.

3. RESEARCH GAP AND QUESTIONS

Although employing various (non-)strategic behaviors to support executive functions (EFs) may benefit academic success, there is limited understanding of how students manage complex study tasks in daily life and how these behaviors support their EFs. This gap calls for studies focusing on students' perceptions and experiences concerning their strategies to deal with complex study tasks to enhance EF support in higher education.

The research questions are:

1. What (non-)strategic behaviors do higher education students employ to manage new and complex study tasks?
2. Which executive functions are supported by these (non-)strategic behaviors?

4. METHODS

4.1. Research Methodology

This qualitative study uses a hybrid approach, including inductive (step 1; research question 1) and deductive (step 2; research question 2) thematic analyses. Thematic analysis is a non-linear and iterative process that recognizes, examines, and communicates patterns (i.e., themes) within data (Braun & Clarke, 2019). In step 1, we applied an inductive data-driven approach exploring the raw data for meaningful descriptions of the subjective student-reported (non-)strategic behaviors to challenging study tasks. Subsequently, in step 2, these (non-)strategic behaviors were evaluated qualitatively by experts and categorized into specific EFs, following a theory-driven approach based on the theoretical framework of Gioia et al. (2000). However, given the fact that the study was conducted in a Dutch context, we supplemented this framework with Scholte and Noen's (2011) framework, which includes nuanced adjustments to the operationalizations tailored to the Dutch context, ensuring cultural and linguistic relevance. Scholte and Noens (2011) used the following operationalizations for EF:

- *Inhibition*: the ability to control impulses and stop actions at appropriate moments, essential for managing social and task behaviors;
- *Flexibility*: the ability to adapt to changes, shift focus, and solve problems in dynamic contexts;
- *Self-Monitoring*: the awareness of one's behavior and its impact on others to ensure socially appropriate actions;
- *Initiation*: the ability to independently start tasks or generate ideas without external prompts;
- *Working Memory*: the capacity to retain and use information for completing multi-step tasks and following instructions;
- *Planning and Organization*: the ability to set goals, create strategies, and organize materials to complete tasks efficiently;
- *Task Monitoring*: maintaining awareness of progress, identifying errors, and ensuring successful task completion;
- *Emotion Regulation*: the ability to manage emotional responses and avoid disproportionate reactions;
- *Orderliness*: organization of physical spaces to maintain efficiency in daily activities.

4.2. Participants

Students of a University of Applied Sciences were recruited through invitations sent by email and during lectures. Participants were purposefully sampled, and to ensure symbolic representation, we included only higher education students aged between 17 and 26, focusing on young adults. No restrictions were placed on the students' academic year or field of study to ensure diversity. However, diversity was considered a secondary selection criterion, monitored but not prioritized.

This process resulted in a sample of 23 students (mean age 22.48 years, $sd=2.48$; male 52%, female 48%; education: Applied Psychology 73.9%, Creative Media and Technology 21.7%, and one student Human Resource Management).

4.3. Data Collection

The interviews took place in November and December 2021, face-to-face and online, and lasted an average of 85 minutes. Twenty students were engaged in dyadic or group interviews with six to eight students. These interviews have the advantage that the interaction allows participants to share, compare, and refine experiences (Morgan, 1996). Due to practical limitations, three students were interviewed individually. Individual interviews offer deeper insights and allow more unrestrained expression without group influence, resulting in richer data (Patton, 2015).

The interviewers followed a semi-structured guide (see Supplementary 1 for additional information; please refer to the link: <https://doi.org/10.17026/SS/XWJRCC>). Each interview started with an introduction to the topics that would be explored. Next, the students were asked probing questions about written vignettes that set out challenging study tasks that all students typically face. The interviewers were instructed to start with prestructured queries and follow the students' line of thinking as much as possible, using both open and guiding questions.

4.4. Ethical Protocol

The study was pre-approved by an Applied University ethical advisory committee (SEAC-2019-14 B). Students received information and signed an informed consent.

4.5. Data Analyses

The interviews were audio-recorded using MS Teams, transcribed verbatim, and thematically analyzed using Atlas.ti software v22, Microsoft Excel, and Microsoft Word.

For the first research question, we employed Braun and Clarke's reflexive thematic analysis (RTA) to explore patterns in the data (Braun & Clarke, 2019). This inductive approach allowed themes to emerge naturally from the participants' reported experiences without being constrained by predefined categories or theoretical frameworks. This aligns with Braun and Clarke's constructivist and interpretivist paradigm, which values the subjectivity of researchers as an integral part of the analytic process. Themes were developed through iterative discussions and reflexive engagement with the data involving DM, SH, and JS. Following an initial calibration session, each researcher independently coded text fragments or sentences and assigned labels reflecting the essence of each behavior (i.e., quotation). Subsequently, these codes were then clustered into themes through collaborative discussions. Any discrepancies in interpretations during the coding process were resolved through further discussions. The subjective nature of this phase meant that we did not aim for inter-rater reliability, as it is not consistent with the principles of RTA (Braun & Clarke, 2019). Instead, we prioritized coherence and depth in the interpretative process. The resulting themes represent a co-constructed understanding of the data, shaped by the researchers' reflections and interactions with the participants' narratives.

Given the study's exploratory nature, we aimed for sufficient information power rather than data saturation (Varpio, Ajjawi, Monrouxe, O'Brien, & Rees, 2017). The concept of information power posits that the greater the amount of relevant information held within the study's sample, the fewer participants are required (Malterud, Siersma, & Guassora, 2015). Adequate information power depends on several dimensions: (1) the objectives of the study, (2) the specificity of the sample, (3) the incorporation of established theories, (4) the quality of interaction, and (5) the approach to analysis. We aim to meet at least four of these dimensions: (1) a focused scope, specifically exploring supportive EF (non-)strategic behaviors in higher education; (2) a specific target group of young adult higher education students; (3) a theoretical framework, in our study the EF framework, which served as the

foundation for the deductive part; (4) a high-quality dialogue, achieved through in-depth interviews, and (5) a cross-case analysis searching for different (non-)strategic behaviors and common themes.

We adopted a theory-driven, deductive approach to thematic analysis for the second research question. Using Gioia et al.'s (2000) theoretical framework, supplemented by Scholte and Noens's (2011) Dutch operationalizations of EFs, we aimed to assign the (non-)strategic behaviors identified in the first phase to specific EFs. This deductive phase applied a predefined coding framework to ensure alignment with established theoretical constructs.

Unlike the inductive approach for RQ1, this phase required a structured process to calibrate interpretations among researchers DM, SV, and JG. Although Braun and Clarke's RTA (2019) discourages inter-rater reliability for exploratory coding, we incorporated calibration sessions to enhance the consistency and transparency of our deductive coding. These sessions ensured that the operational definitions of EFs were applied uniformly while maintaining space for interpretative depth. Our hybrid approach bridges Braun and Clarke's method's flexibility with the pragmatic need for transparency in the deductive coding process. It allowed us to systematically analyze how specific (non-)strategic behaviors support particular EFs while preserving the data's complexity and richness. See Supplementary 1 for additional information; please refer to the link: <https://doi.org/10.17026/SS/XWJRCC>.

5. RESULTS

Table 1 presents the results of the study related to both research questions, namely:

RQ 1: 'What (non-)strategic behaviors do higher education students employ to manage new and complex study tasks?' and

RQ 2: 'Which executive functions (EFs) are supported by these (non-)strategic behaviors?'

The first column of Table 1 provides a comprehensive overview of the themes derived from students' reported (non-)strategic behaviors. Column 2 contains the found (non-)strategic behaviors, where one or more literal student quotations are summarized as statements for clarity and conciseness. Column 3 refers to the results related to RQ 2, indicating which EF is predominantly associated with each (non-)strategic behavior. Finally, for a detailed overview of these themes, (non-)strategic behaviors, executive functions, and example quotations, see Supplementary 2; please refer to the link <https://doi.org/10.17026/SS/XWJRCC>.

Table 1.

Themes, statements (non-)strategic behaviors, and corresponding executive function.

Theme	Statement (non-)strategic behavior	Supporting the Executive Function
Annotating involves finding and highlighting the content's essential ideas or key messages.	I highlight key sections in the text.	Working memory
	I distinguish between main and secondary issues.	Organization

Theme	Statement (non-)strategic behavior	Supporting the Executive Function
Assertive communication is about setting boundaries to get your tasks done.	If I want to study quietly, I ask others not to bother me.	Working memory
	If I think the quality of the learning environment is poor, I express my opinion to a lecturer.	Flexibility
Attention regulation involves optimizing one's mental state to improve concentration.	I take a break to help me feel more alert or calm down, a break where I do nothing, go for a walk, take a nap, shower, or play games.	Flexibility
	I put on some sound, a YouTube walking tour, or music to help me concentrate better.	Working memory
	I do not play music because it distracts me.	Inhibition
	I use tools like apps or a kitchen timer to help me focus for a certain period.	Working memory
	I take substances, like caffeine or medication, to help me concentrate.	Working memory
	I start working at times when I can concentrate better than at other times.	Working memory
	I take good care of myself (like getting enough sleep, eating and drinking properly, and exercising) to manage and sustain my study tasks.	Planning
Checking work refers to looking closely at a completed task to verify if all requirements are met.	I check my work before handing it in to ensure it is complete.	Task monitoring
Coping with stress refers to coping mechanisms.	When I get emotional, I accept it.	Emotion regulation
	When problems arise, I step back and look at the situation from a different angle.	Flexibility
	When I feel stressed, I consciously let my thoughts pass by to help me relax.	Emotion regulation
Coping with changes in study tasks.	I am flexible if a study task changes, such as an adjustment to the assignment.	Flexibility
	If something changes, like an assignment change, I carefully consider how much more energy I want to put into it.	Flexibility
Coping with failure refers to dealing with a lack of success through (un)helpful thoughts.	I accept that failure is part of the process and is not a disaster if things occasionally go wrong.	Emotion regulation
	I think avoiding failure is best, so I quit early or did not even begin the study task.	Emotion regulation

How Do Students Manage Challenging Study Tasks? - A Thematic Analysis of Higher Education Students' (Non-)Strategic Study-Related Behaviors

Theme	Statement (non-)strategic behavior	Supporting the Executive Function
Creating an overview by structuring and prioritizing information to get a clear picture.	I ensure I get an overview of everything I need to do.	Organization
	When I begin a study task, I review what I must do, including the assessment criteria and deadlines.	Planning
Elaboration refers to adding more detail or information to enhance understanding and memory of a concept or idea.	I ask myself in-depth questions to check what I know about the subject or form my opinion.	Working memory
	I delve into the subject matter by discussing it with others.	Organization
	I learn by explaining the subject matter aloud to myself or others.	Working memory
Following structure refers to adhering to a provided structure.	I attend all the lectures for a course.	Organization
	I do the assigned homework.	Organization
Internal self-talk refers to having encouraging or reassuring thoughts.	I talk to myself in a reassuring way.	Emotion regulation
	I tell myself encouraging things.	Emotion regulation
Lecturer support refers to seeking or asking for a lecturer's support.	I study near a lecturer, which motivates me to get to work.	Initiation
	I ask my lecturer for feedback on, for example, an assignment I have done or a schedule.	Task monitoring
	I ask the lecturer questions about the subject matter.	Organization
Managing distractions involves handling internal distractions. This could vary from ignoring them to giving in.	I ignore distractions around me, like a mobile phone on the table or people talking.	Inhibition
	I ensure that no external distractions are near me or avoid them altogether.	Inhibition
	If I catch myself having distracting thoughts, I get back to the task at hand.	Inhibition
Memory support involves using one or more methods to help retain and recall study material.	I use memory techniques such as mnemonics and incorporating humor.	Working memory
	I retain study material by repeating it frequently or by engaging with it extensively.	Working memory
	I remember study material or tasks by writing them down or recording them as voice notes.	Working memory
	I assume that I will automatically remember important study material.	Working memory
Managing the environment involves organizing and optimizing the	I tidy my work area before starting a task, such as organizing my desk or computer folders.	Organization
	I ensure I have suitable materials for studying, such as a laptop or a notepad.	Organization

Theme	Statement (non-)strategic behavior	Supporting the Executive Function
environment to carry out a study task effectively.	I have set up a workspace I use exclusively for studying, associating it with study time.	Organization
Organizing learning refers to structuring study content and tasks to help simplify the complex amount of information or tasks.	I structure my notes by, for example, creating a diagram or showing connections with lines.	Organization
	I break my tasks into smaller sub-tasks.	Organization
	I visualize how the learning material is structured by creating a mind map, for example.	Working memory
Peer support involves learning through interaction with peers.	I ask my fellow students for information, explanations, or tips on the content or design of the study task	Organization
	I use the social pressure from my fellow students to engage in studying.	Initiation
	I use feedback from my fellow students to check if I am on the right track.	Task monitoring
	Right before an exam starts, I quickly review the material with one or more classmates to refresh my memory.	Working memory
	I seek support from others to manage my stress.	Emotion regulation
Planning refers to scheduling appointments, deadlines, or the steps needed to complete a task on time.	I plan out what I need to do and when.	Planning
	I stick to the schedule.	Planning
	I make a rough plan where I outline what I am loosely planning to do	Planning
	I have developed routines for myself.	Planning
	I agree with myself in advance on the maximum amount of time I will work on a task.	Planning
	I give myself a deadline for my study task, which forces me to get to work.	Task monitoring
	I use a calendar (digital or paper).	Planning
	I incorporate a study task's requirements, deadlines, and assessment criteria into my planning.	Planning
	I keep a tight schedule.	Planning
	I list the most important tasks or topics and start working on them.	Planning
Problem-solving involves looking for solutions to a problem and implementing the perceived best one.	If I encounter a problem, I look for solutions by myself or discuss it with others.	Flexibility
	If I cannot figure out a problem, I set it aside for a while and return to it later.	Flexibility
	If I do not know how to tackle a problem, I make a step-by-step plan and follow it.	Organization

How Do Students Manage Challenging Study Tasks? - A Thematic Analysis of Higher Education Students' (Non-)Strategic Study-Related Behaviors

Theme	Statement (non-)strategic behavior	Supporting the Executive Function
	I try to solve a problem through trial and error.	Task monitoring
Procrastinating or avoiding refers to delaying or increasing the pressure to start a task or to avoid facing it.	I stop working on a study task if I cannot progress.	Task monitoring
	I start my study task when the deadline is so close that I have no choice but to start it.	Initiation
Self-motivation involves actively or passively finding reasons or feeling the drive to tackle a study task.	I switch between fun and boring study tasks.	Flexibility
	I assess how much effort each study task needs and plan my schedule based on that.	Planning
	I work during the times of the day when I know my energy is higher.	Planning
	I motivate myself to start by reminding myself that it helps me avoid unpleasant things.	Initiation
	During a class, I only pay attention when the topics are important or interesting.	Working memory
Self-reflection refers to thinking about and analyzing one's thoughts, feelings, behaviors, and experiences to gain self-awareness and personal growth.	I reflect on how I handled study tasks in the past to learn from my mistakes.	Task monitoring
Starting and persevering refer to beginning a task and finishing it.	I use tools, like reminders, to help me remember to get to work.	Initiation
	I start a study task without overthinking it.	Initiation
	I study for as long as possible and see how far I get.	Working memory
	I start with a simple or fun task.	Initiation
	I tackle the most challenging task first.	Initiation
	I make sure help is available when working on a study task so I can continue if I have a question.	Flexibility
	I focus on the things that interest me.	Working memory
	When the deadline is near, I feel the pressure and work really hard for a while.	Initiation
Top-down learning refers to starting with an overview or general understanding and	I listen to the entire explanation before I start taking notes.	Working memory
	First, I write down what is said and then figure out what it means later.	Organization
	I attend a lecture before I study the material.	Organization

Theme	Statement (non-)strategic behavior	Supporting the Executive Function
progressively focusing on finer details.	I skim through the study material first and then study it in depth.	Organization
Using examples and feedback refers to applying specific instances or case studies to understand concepts better and incorporating feedback from others to improve one's knowledge and skills.	I use other people's examples, like an existing student summary.	Organization
	I learn in various ways, like through different examples.	Flexibility
Using learning resources to read or watch one or more sources of information to acquire new knowledge or skills.	I use the lecture slides.	Organization
	I use Google or YouTube to understand the material better.	Flexibility
	I prefer to stick to one type of information source when working on a study task. For instance, I prefer studying PowerPoint presentations instead of course manuals or books.	Organization
Visualizing refers to thinking about what to learn and creating meaningful mental images of the study material.	I visualize in my mind what I need to do or how the subject matter is structured.	Working memory

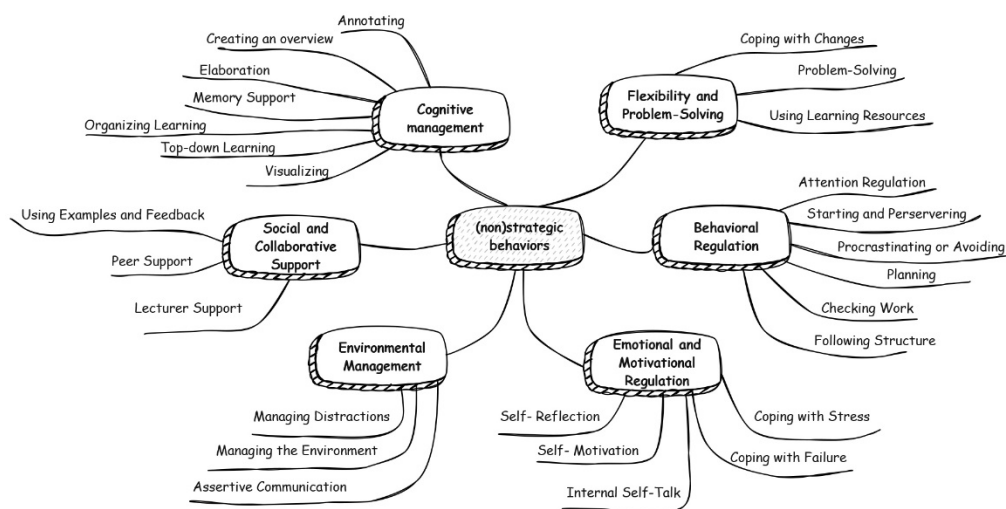
Regarding RQ 1, students' (non-)strategic behaviors, the iterative process led to the interpretation of 89 codes as (non-)strategic behaviors, which were then categorized under 27 themes. Each theme includes at least one (non-)strategic behavior described as a statement. For instance, the theme '*Following structure*' encompasses students' behaviors of adhering to a provided structure, such as '*I do the assigned homework.*'

The 27 identified themes were grouped into six overarching clusters in an additional analysis to provide a more transparent overview and better understand the relationships between themes (see Figure 1). These clusters represent at least a few key processes through which students manage challenging study tasks. The following clusters were identified:

1. *Cognitive Management*: Themes focused on understanding, organizing, and processing information, including annotating, creating an overview, and memory support.
2. *Flexibility and Problem-Solving*: Themes emphasizing adaptability and finding solutions, such as coping with changes, problem-solving, and using learning resources.
3. *Behavioral Regulation*: Themes related to starting, sustaining, and completing tasks, such as attention regulation, planning, and following structure.

4. *Emotional and Motivational Regulation*: Themes supporting emotions and motivation during studying, such as coping with stress, self-motivation, and self-reflection.
5. *Environmental Management*: Themes addressing creating a productive study environment, such as managing distractions and assertive communication.
6. *Social and Collaborative Support*: Themes focused on leveraging social interactions, including peer support and seeking feedback from lecturers.

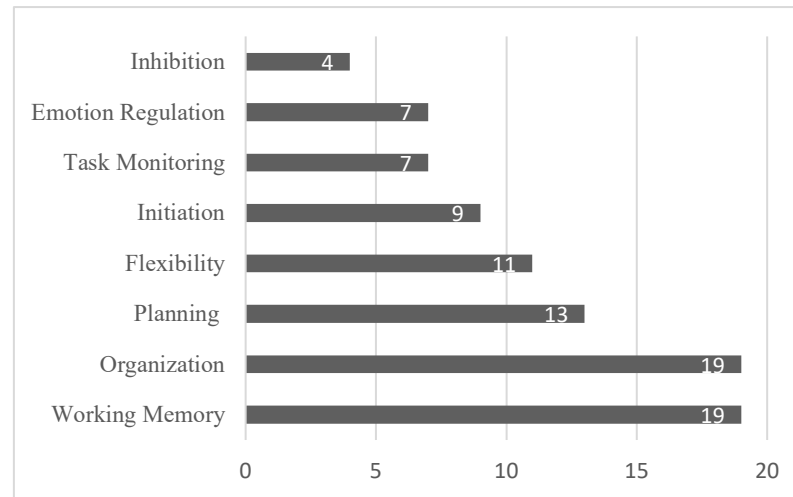
Figure 1.
An overview of the clusters of related themes.



We did not distinguish between strategic and non-strategic behaviors because the distinction between non-strategic and strategic is not always straightforward. However, we observed that students sometimes mentioned *intentionally* using (non-)strategic behaviors, while others mentioned acting *unintentionally*. For example, one student might turn on music without thinking about it. Controversely, another student might play music deliberately, understanding why it works for them, showing more strategic behavior as shown in this quotation: “White noise is also very much conditioned in my head by now to focus.... so as soon as [...] I put white noise on Spotify I do get a focus”. In this case, the student understands a working mechanism (i.e., conditioning), demonstrating cognitive strategy knowledge. Furthermore, we noticed that students mentioned using multiple (non-) strategic behaviors when facing challenges, indicating that students use various (non-) strategic behaviors simultaneously instead of applying a single strategy.

The study's results regarding RQ2, involving (non-)strategic behaviors supporting EF, are illustrated in the last two columns of Table 1. These columns contain the found (non-) strategic behaviors followed by the EF that is predominantly supported by that specific (non-)strategic behavior. For a detailed overview of the (non-)strategic behaviors, executive functions, themes, and quotations, see Supplementary 2; please refer to the link: <https://doi.org/10.17026/SS/XWJRCC>.

Figure 2.
Frequency of (non-)strategic behaviors assigned to specific executive functions.



The distribution of (non-)strategic behaviors across different EFs was uneven; see Figure 2. For instance, self-monitoring had no attributed (non-)strategic behaviors, and EF orderliness had only one (*'I tidy my workspace, including my desk and computer folders, whenever I engage in a study task'*). In contrast, EF organization and EF working memory had nineteen assigned (non-)strategic behaviors. The remaining EFs included four to nineteen (non-)strategic behaviors. Ultimately, we excluded EF orderliness and EF self-monitoring. The most typical behavior assigned to EF orderliness, namely *'tidying up the workspace,'* can also be seen as organizing the workspace. The reason why students did not mention behaviors supporting self-monitoring is unclear. Self-monitoring involves checking, monitoring, and directing one's behavior, especially concerning others. We suspect we did not adequately inquire about this EF during the interviews.

For each EF, (non-)strategic behaviors can be found with similar actions. This implies that students often engage in similar actions to support different EFs, even though the specific goals may vary. For instance, to support their EF inhibition (i.e., the ability to resist distractions), students take steps to eliminate distractions from their environment (*'I make sure there are no external distractions around me'*). At the same time, to support their EF organization, students engage in similar actions but with a different focus; for instance, they aim to organize their study materials (*'I tidy my work area before starting a task, such as organizing my desk or computer folders'*).

6. FUTURE RESEARCH DIRECTIONS

This study underscores the value of qualitative research in capturing the nuanced (non-) strategic behaviors students use to support EFs. Future qualitative research could explore how students perceive the link between these behaviors and academic success, using longitudinal interviews or reflective journaling to trace their evolution.

Additionally, future research could replicate our qualitative study among diverse groups of students in different contexts to further explore the potential types of (non-)strategic behaviors. Also, future qualitative research could inform the design of more personalized educational approaches based on these insights, which could be tested through intervention studies. Additionally, quantitative methodologies could be employed in future research to determine students' preferences and frequency of use for the (non-)strategic behaviors. Lastly, students who participated in the interviews reported that discussing these themes was unexpectedly informative and valuable for enhancing their own metacognitive awareness. Therefore, the selected data collection approach demonstrates practical applicability and merit.

7. DISCUSSION

This study focused on two main research questions: What (non-)strategic behaviors do students exhibit during their studies, and which EFs do these behaviors mainly support?

In response to the first research question, the study unveiled various themes containing both strategic and non-strategic behaviors students employ in learning and studying. Whether a behavior's nature is more strategic or not (e.g., a habit or routine) depends on a student's adaptability in applying the behavior in a particular context and at a specific time. This corresponds with the strategy literature, which defines effective strategy deployment as requiring three types of knowledge: declarative knowledge (understanding "what" to do and "why"), procedural knowledge (understanding "how"), and conditional knowledge (understanding "when") (Van Meter & Campbell, 2020).

The themes and associated behaviors are consistent with theories about how people generally deal with problems, stressors, and other challenges in life, such as assimilation and accommodation (Hanfstingl, Arzenšek, Apschner, & Göllly, 2021). It is noticeable that the themes and (non-)strategic behaviors range from being more internally focused to more externally focused, which fits with human adaptability by changing oneself ('accommodation') or the environment ('assimilation') (Hanfstingl et al., 2021). More internally focused themes included attention regulation, coping with emotions and stress, or asking oneself in-depth questions. Additionally, externally focused themes include interaction with others and resources involving assertive communication, seeking peer support, or setting up an optimal workspace.

The clustering of themes into six categories highlights the multidimensional nature of (non-)strategic behaviors, showing how cognitive, behavioral, emotional, and social strategies are interconnected. The findings underscore the interplay of cognitive, emotional, and environmental factors in learning and studying, resonating with self-regulated learning theories (e.g., Zimmerman, 2015). Self-regulated learning involves the deliberate use of strategies within the learning context. Examples from the study, such as structuring learning material, asking oneself in-depth questions, or repeating information, demonstrate how students exhibit behaviors characteristic of self-regulated learning. Furthermore, students frequently use these behaviors in clusters across categories and themes, adding another layer of complexity to their behaviors. For instance, they combine methods such as organizing their workspace, asking themselves reflective questions, working near peers, and using caffeine.

The second research question delves into EFs' perspectives on (non-)strategic behaviors. EFs do not operate in isolation but interact with other EFs (Miyake et al., 2000). However, in this study, we decided to assign individual (non-)strategic behaviors only to the EF that it predominantly supported. This approach reflects the limited literature on EF strategies in education, which similarly categorizes strategies and recommendations by

individual EFs. This is primarily for practical reasons, as it allows for targeted interventions in education at the level of a specific EF that a student is likely struggling with.

The identified (non-)strategic behaviors support EF in various ways. Some (non-)strategic behaviors are preventive, allowing an EF to remain 'inactive,' while others assist in deploying a specific EF by reducing its cognitive load. For instance, putting away a mobile phone prevents a student from needing to use their inhibitory control to resist distractions. Conversely, playing music to enhance concentration supports the working memory that is active at that moment.

The primary aim of existing literature is to translate theory into practical tools for education. One relevant classification of research-based EF strategies, applicable in both primary and secondary education, originates from the work of Meltzer, Reddy, and Sayer (2014). This classification focuses on EFs influencing academic performance and provides tips and tools. Our study's contribution lies in its comprehensive categorization of non-strategic and strategic behaviors in higher education students, which is not fully addressed in the existing literature. Understanding which behaviors support specific EFs can assist students in identifying which (non-)strategic behaviors aid specific EFs, such as addressing their weak EF.

Another strength of this research, and qualitative research in general, is the rich information that can lead to a deeper understanding of complex human experiences in practice. In our study, we aimed to gather rich data through in-depth interviews by harnessing five researchers' diverse creativity and expertise throughout the various stages of theme development (Vaismoradi, Jones, Turunen, & Snelgrove, 2016). During calibration sessions, (non-)strategic behaviors and themes were discussed, and arguments were presented for the choices.

7.1. Limitations

A strength of this research is our pursuit of information power, as Malterud et al. (2015) suggested. We met four dimensions, justifying our relatively small sample size. However, our study's limitation lies in dimension five, as our chosen analysis strategy requires more cross-case analyses. Researchers compare and contrast multiple cases in cross-case analysis to identify common patterns and differences, which often necessitates a larger sample size to ensure comprehensive coverage of variations. However, the sample size remains a subjective decision of the researchers and depends on their experience (Malterud et al., 2015).

7.2. Educational Implications

Identifying (non-)strategic behaviors holds relevant implications for educators and students. Educators engaged in teaching and student guidance can leverage insights from this study to provide more personalized instruction and coaching. By incorporating findings on student (non-)strategic behaviors into explicit lessons or mentoring sessions, educators can explore the what, how, when, and why of (non-)strategic behaviors, encouraging students to reflect on their usage and identify areas for improvement. For example, the results of this study will be used to develop a mentoring program for first-year students in our Applied Psychology program.

This research offers insights into (non-)strategic behaviors like procrastination or distraction followed by a need to refocus, which can inform the design of learning environments. For instance, including formative and summative assessments with shorter deadlines and supportive prompts in instructional materials can enhance the effectiveness of adaptive learning environments.

8. CONCLUSION

The study reveals that higher education students employ various (non-)strategic behaviors to manage complex study tasks, reflecting the dynamic nature of students' EFs. These behaviors, categorized into 27 themes and six overarching categories, demonstrate that students use deliberate strategies and routine actions to manage their tasks.

The findings could serve as starting points for personalized educational interventions focusing on these diverse behaviors to enhance students' learning and studying experiences. Additionally, the study highlights the need for further research to explore these behaviors' effectiveness and better understand the role of EFs in higher education learning processes.

REFERENCES

- Baars, M. A., Nije Bijvank, M., Tonnaer, G. H., & Jolles, J. (2015). Self-report measures of executive functioning are a determinant of academic performance in first-year students at a university of applied sciences. *Frontiers in Psychology*, 6, 1131. <https://doi.org/10.3389/fpsyg.2015.01131>
- Baggetta, P., & Alexander, P.A. (2016). Conceptualization and Operationalization of Executive Function. *Mind, brain, and education*, 10(1), 10-33. <https://doi.org/10.1111/mbe.12100>
- Barkley, R.A. (2012). *Executive functions. What they are, how they work, and why they evolved*. New York: Guilford Press.
- Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, 11(4), 589–597. <https://doi.org/10.1080/2159676X.2019.1628806>
- De Boer, H., Donker, A.S., Kostons, D.D.N.M., & Van der Werf, G. P.C. (2018). Long-term effects of metacognitive strategy instruction on student academic performance: A meta-analysis. *Educational Research Review*, 24, 98-115. <https://doi.org/10.1016/j.edurev.2018.03.002>
- Denckla, M. B., & Mahone, E. M. (2018). Executive function. Binding together the definitions of Attention-Deficit/Hyperactivity Disorder and Learning Disabilities. In L. Meltzer (Ed), *Executive function in education. From theory to practice* (2nd ed., pp. 5–24). New York: Guilford Press.
- Diamond A. (2013). Executive functions. *Annual review of psychology*, 64, 135–168. <https://doi.org/10.1146/annurev-psych-113011-143750>
- Diamond, A. (2014). Want to optimize executive functions and academic outcomes? Simple, just nourish the human spirit. In P. D. Zelazo & M. D. Sera (Eds.), *Developing cognitive control processes: Mechanisms, implications, and interventions* (pp. 205–230). Hoboken, New Jersey: John Wiley & Sons Inc.
- Draper, E.A. & Cevasco-Trotter, A. (2023). Supporting Executive Function Skills in Music Education: Strategies for Students with Disabilities. *Journal of General Music Education*, 36(3), 42– 45. <https://doi.org/10.1177/27527646231157690>
- Garner, J. (2009). Conceptualizing the relations between executive functions and self-regulated learning. *Journal of Psychology: Interdisciplinary and Applied*, 143(4), 405–426. <https://doi.org/10.3200/JRLP.143.4.405-426>
- Gioia, G.A., Isquith, P.K., Guy, S.C., & Kenworthy, L. (2000). Test review. Behavior Rating Inventory of Executive Function. *Child Neuropsychology*, 6 (3), 235–238. <https://doi.org/10.1076/chin.6.3.235.3152>
- Hanfstingl, B, Arzenšek, A., Apschner, J., & Göllly, K. I. (2021). Assimilation and Accommodation. A Systematic Review of the Last Two Decades. *European Psychologist*, 27(4), 320-337. <https://doi.org/10.1027/1016-9040/a000463>
- Malterud, K., Siersma, V. D., & Guassora, A. D. (2015). Sample size in qualitative interview studies: Guided by information power. *Qualitative Health Research*, 26(13), 1753-1760. <https://doi.org/10.1177/1049732315617444>

- Manuhuwa, D. M., Snel-De Boer, M., Jaarsma, A. D. C., Fleer, J., & De Graaf, J. W. (2023). The combined value of executive functions and self-regulated learning to predict differences in study success among higher education students. *Frontiers in Psychology, 14*, 1229518. <https://doi.org/10.3389/fpsyg.2023.1229518>
- Meltzer, L., Greschler, M.A., Davis, K., & Vanderberg, C. (2021). Executive Function, Metacognition, and Language: Promoting Student Success with Explicit Strategy Instruction. *SIG 1 Language Learning and Education, Clinical Focus, 6*(6), 1343-1356. https://doi.org/10.1044/2021_PERSP-21-00034
- Meltzer, L., Reddy, R., & Sayer, J. (2014). *Metacognitive Awareness System, Revised (MetaCOG-R)*. Research Institute for Learning and Development.
- Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex “frontal lobe” tasks: A latent variable analysis. *Cognitive Psychology, 41*(1), 49–100. <https://doi.org/10.1006/cogp.1999.0734>
- Morgan, D. (1996). *Focus groups as qualitative research (2nd ed.)*. Thousand Oaks, California: Sage.
- Musso, M. F., Boekaerts, M., Segers, M., & Cascallar, E. C. (2019). Individual differences in basic cognitive processes and self-regulated learning: their interaction effects on math performance. *Learning and Individual Differences, 71*, 58-70. <https://doi.org/10.1016/j.lindif.2019.03.003>
- Naglieri, J. A. & Otero, T. M. (2014). The Assessment of Executive Function Using the Cognitive Assessment System: Second Edition. In S. Goldstein & J. Naglieri (Eds.) *Handbook of Executive Functioning* (pp. 191-208). New York: Springer.
- Nigg, J. T. (2017). Annual research review: on the relations among self-regulation, self-control, executive functioning, effortful control, cognitive control, impulsivity, risk-taking, and inhibition for developmental psychology. *Journal of Child Psychology and Psychiatry, 58* (4), 361–383. <https://doi.org/10.1111/jcpp.12675>
- Patton, M. Q. (2015). *Qualitative Research & Evaluation Methods* (4th ed.). Thousand Oaks, California: Sage.
- Pinochet-Quiroz, P., Lepe-Martínez, N., Gálvez-Gamboa, F., Ramos-Galarza, C., Del Valle Tapia, M., & Acosta-Rodas, P. (2022). Relationship between cold executive functions and self-regulated learning management in college students. *Estudios Sobre Educacion, 43*, 93-113. <https://doi.org/10.15581/004.43.005>
- Schneider, W. (2010). The Development of Metacognitive Competences. In B. Glatzeder, V. Goel & A. Müller (Eds.), *Towards a Theory of Thinking* (pp. 203–214). New York: Springer.
- Scholte, E., & Noens, I. (2011). *BRIEF-A: Vragenlijst over executieve functies bij volwassenen: Handleiding*. [BRIEF-A: Questionnaire on Executive Functions in Adults: Manual]. Amsterdam: Hogrefe.
- Sebesta, A. J., & Speth, E. B. (2017). How Should I Study for the Exam? Self-Regulated Learning Strategies and Achievement in Introductory Biology. *CBE—Life Sciences Education, 16*(2). <https://doi.org/10.1187/cbe.16-09-0269>
- Vaismoradi, M., Jones, J., Turunen, H., & Snelgrove, S. (2016). Theme development in qualitative content analysis and thematic analysis. *Journal of Nursing Education and Practice, 6*(5), 100-110. <https://doi.org/10.5430/jnep.v6n5p100>
- Van Meter, P., & Campbell, J. M. (2020). A conceptual framework for defining strategies and strategic processing. In D. L. Dinsmore, L. K. Fryer, & M. M. Parkinson (Eds.), *Handbook of strategies and strategic processing* (pp. 82–96). New York: Routledge.
- Varpio, L., Ajjawi, R., Monrouxe, L. V., O'Brien, B. C., & Rees, C. E. (2017). Shedding the cobra effect: Problematising thematic emergence, triangulation, saturation, and member checking. *Medical Education, 51*(1), 40–50. <https://doi.org/10.1111/medu.13124>
- Zelazo, P. D. (2015). Executive function: Reflection, iterative reprocessing, complexity, and the developing brain. *Developmental Review, 38*, 55–68.
- Zimmerman, B. J. (2015). Self-regulated Learning: Theories, Measures, and Outcomes. *International Encyclopedia of the Social Behavioral Sciences* (2nd ed), 541-546. <https://doi.org/10.1016/B978-0-08-097086-8.26060-1>

ADDITIONAL READING

- Dawson, P., & Guare, R. (2016). *The smart but scattered guide to success: How to use your brain's executive skills to keep up, stay calm, and get organized at work and at home*. New York: The Guilford Press.
- Goldstein, S., & Naglieri, J. A. (Eds.). (2014). *Handbook of executive functioning*. New York: Springer.
- Meltzer, L. (Ed.). (2007). *Executive function in education: From theory to practice*. New York: The Guilford Press.

AUTHORS' INFORMATION

Full name: Diane Marcia Manuhuwa

Institutional affiliation: Saxion University of Applied Sciences, School of Applied Psychology and (International) Human Resource Management, Program Employability Transition, Section Inclusive Society

Institutional address: Handelskade 75, 7417 DH Deventer, Netherlands

Email address: d.m.manuhuwa@saxion.nl

Biographical sketch: Diane Manuhuwa is an educational technologist and postdoctoral psychologist with clinical experience. She is a senior lecturer in higher education, a senior researcher in the Inclusive Society group, and is conducting PhD research on executive functions in higher education students. ORCID: 0000-0002-7700-8751.

Full name: Simone Hanegraaff

Institutional affiliation: School of Applied Psychology and (International) Human Resource Management, Program Employability Transition, Section Inclusive Society

Institutional address: Handelskade 75, 7417 DH Deventer, Netherlands

Email address: s.m.hanegraaff@saxion.nl

Biographical sketch: Simone Hanegraaff is an independent researcher with a background in Environmental Sciences and currently studies Psychology. As part of this research, she worked with the Employability Transition program.

Full name: Johanna Schönrock-Adema

Institutional affiliation: University Medical Center Groningen and University of Groningen, department Wenckebach Institute for Education and Training

Institutional address: A. Deusinglaan 1, 9713 AV Groningen, Netherlands

Email address: j.schonrock-adema@umcg.nl

Biographical sketch: Johanna Schönrock-Adema is a psychologist working as a senior education researcher at the UMCG and as a researcher in Music in Context at the Prins Claus Conservatoire of the Hanze University of Applied Sciences in Groningen. ORCID: 0000-0002-9844-339X.

Full name: Sjoerd J. de Vries

Institutional affiliation: School of Applied Psychology and (International) Human Resource Management, Program Employability Transition, Section Inclusive Society

Institutional address: Handelskade 75, 7417 DH Deventer, Netherlands

Email address: s.j.devries@saxion.nl

Biographical sketch: Sjoerd de Vries is an Associate professor (associate lector) at the Saxion University of Applied Science, School of Applied Psychology and HRM. ORCID: 0000-0001-8340-047X.

D. Manuhuwa, S. Hanegraaff, J. Schönrock-Adema, S. de Vries, J. de Graaf, & J. Fleer

Full name: Jan Willem de Graaf

Institutional affiliation: School of Applied Psychology and (International) Human Resource Management, Program Employability Transition, Section Inclusive Society

Institutional address: Handelskade 75, 7417 DH Deventer, Netherlands

Email address: j.w.degraaf@saxion.nl

Biographical sketch: Jan Willem de Graaf is a professor (lector) at the Saxion University of Applied Science, School of Applied Psychology and HRM. ORCID: 0000-0002-9094-7817.

Full name: Joke Fleer

Institutional affiliation: University of Groningen, University Medical Center Groningen, Department of Health Sciences, Section Health Psychology

Institutional address: Hanzeplein 1, 9713 GZ Groningen, Netherlands

Email address: j.fleer@umcg.nl

Biographical sketch: Joke Fleer is a full professor in health psychology at the UMCG and dean of University College Groningen and Honours College Groningen at the University of Groningen. ORCID: 0000-0002-9116-9404.

* This study was presented at the International Conference on Education and New Developments on June 15-17, 2024.