Student strategy awareness and use: The development of a measure

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Abstract

Students cope with the attentional demands of a university setting by accessing a range of cognitive and behavioural strategies. Yet, they may not be aware of the full scope of strategies available to them. The aim of the study is to design and evaluate the Strategy Use and Awareness Questionnaire to estimate students' awareness and use of strategies that optimize control of attention and/or compensate for stress on an executive system due to environmental and/or neurobiological influences. An item analysis was conducted that included an assessment of dimensionality and item trimming. Findings from an exploratory factor analysis suggest a seven factor solution is optimal; Comprehension Monitoring, Planning/Organization, Self-Reward, Self-Regulation, Organization with Mobile Phone Technology, Distraction Management, and Organization of Materials. This measure is likely to benefit students, as well as counsellors and coaches interested in improving strategy use of students.

Keywords: executive function; strategies; university students; neurodevelopmental disorders; measurement construction

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Table of Contents

List of Tables

List of Acronyms

ADHD	Attention-Deficit/Hyperactivity Disorder
BRIEF-A	Behaviour Rating Inventory of Executive Function - Adult
CAARS	Conners' Adult ADHD Rating Scale
EF	Executive Function
EFA	Exploratory Factor Analysis
SAUQ	Strategy Awareness and Use Questionnaire

Chapter 1.

Introduction

1.1. Overview

Coping with the attentional demands associated with coursework and interacting with peers and adults in a university setting can be challenging at times for all students, especially for students with Attention-Deficit/Hyperactivity Disorder (ADHD) (ADHD; DuPaul, Weyandt, O'Dell, & Varejao, 2009). To be successful learners in a university context, students must not only attend to static symbolic representations of concepts (e.g., readings, lecture notes, and diverse forms of media), but they must also engage in educational practices where they attend to, monitor, and coordinate their own perspectives with those of their professors and peers about these entities. These educational practices are dynamic and fluid as the beliefs and actions of people involved, language registers (e.g., academic-formal versus conversational-informal), and representational modalities (speech, visual, tactile) are constantly in flux. Control of attention and self-regulation of academic and social behaviours in these complex, interactive spaces has long been associated with a specialized system of cognitive resources known widely as "executive functions" (EF) (Miyake, Friedman, Emerson, Witzki, & Howerter, 2000).

Among adults, this executive cognitive system is organized into three overlapping, but partially independent components: inhibition, working memory, and mental set-shifting (Miyake et al., 2000). "Inhibition" or "inhibitory control" represents executive resources that are accessed to override dominant or prepotent responses to maintain attentional focus on the goal at hand. "Working memory" is typically conceptualized as a limited-capacity cognitive workspace where information is temporarily stored and updated as new information retrieved from long term memory or accessed through interactions with the environment, becomes available (Baddeley, 2000). "Mental set-shifting" or "cognitive flexibility" represents executive resources necessary to facilitate flexible shifting of attention among sets of information or tasks (Diamond, 2013; Miyake et al., 2012). Access to this executive system has been implicated in explanations of individual differences in university students' mental health:

depression (Yang & Xiang, 2019), worried affect (Gustavson, Lurquin, Michaelson, Barker, Carruth, von Bastian, Miyake, & Akira, 2019), a sluggish cognitive tempo (Flannery, Luebbe, & Becker, 2017; Wood, Lewandowski, Lovett, & Antshel, 2017), test anxiety (O'Donnell, 2017); academic performance: problem solving (Mori, Kanetaka, Okamoto, & Masahiko, 2018), error monitoring (Mohamed, Börger, Geuze, Meere, & Jaap, 2019), academic procrastination (Bolden & Fillauer, 2019; Rabin, Fogel, & Nutter-Upham, 2011); physical health: quality of diet intake (Marshall & Elliott, 2016), substance misuse (Brunelle & Flood, 2016), binge drinking (Parada, Corral, Mota, Crego, Rodríguez, & Cadaveira, 2012); and social well-being: satisfaction with romantic relationships (Overbey, Snell, & Callis, 2011).

Taken together, these findings affirm the importance of an executive system to everyday functioning of students in a general university population. However, as previously mentioned, the intensity of these impacts is often greater among students diagnosed with neurodevelopmental disorders such as ADHD. As individuals with ADHD are increasingly choosing to pursue post secondary education (Wolf et al., 2009), they now account for approximately 2-8% percent of university students (Dupaul et al., 2009). ADHD symptomatology is associated with self-reported regulation of behaviours controlled by the executive cognitive system (Barkley, 1997; Roth, Lance, Isquith, Fischer, & Giancola, 2013) which includes response inhibition, vigilance, working memory, and planning (Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005).

To alleviate the impact of ADHD symptoms, Cognitive behaviour therapy (CBT) approaches are commonly used in adult populations (Mongia & Hechtman, 2012). In a review of six studies of CBT approaches for university students with ADHD, He and Antshel (2017) identified a wide range of cognitive and behavioural strategies that are thought to support the control of attention in adults. If students have awareness of these strategies, CBT in counselling or coaching sessions could focus on adapting the strategies to improve student perceptions of their efficacy and in turn, students' motivation to use them. If students are not aware of the many strategies available to them, psychoeducational approaches to increase their awareness of strategies, how to implement them, and how to self-evaluate their effectiveness, may be an effective component of CBT intervention. On the other hand, if students report that they use attentional control strategies often and find them helpful, interventions tailored to address other concerns (e.g., learning difficulties, depression, test-anxiety) may become

the focus of CBT intervention. Although knowing about student awareness and use of cognitive and behavioural strategies to control attention may have clinical significance, it is not clear whether students in the six study samples included in He and Antshel's review were initially aware of the scope of strategies available to them and/or whether they found all strategies emphasized in the CBT therapeutic process equally effective. In part, this issue may be a consequence of a lack of psychometrically evaluated instruments to gauge student self-reported strategy use.

Self-report measures that are available, such as the Behavioural Rating Inventory of Executive Functioning -Adult Version (BRIEF-A; Roth, Isquith, & Gioia, 2005) or the Conners' Adult ADHD Rating Scale (CAARS; Conners, Erhardt, & Sparrow, 1999) provide the individual's perspective with respect to their difficulties controlling attention in everyday life activities – an important first step in the intervention process. Valorizing the perspectives of students about the real-life challenges they face due to their perceived EF capacity limitations is important for educators, coaches, and counsellors to facilitate a rapport and a collaborative working relationship (Roth et al., 2005). However, the argument can be made that assessing and validating student beliefs about the strategies they use to optimize attentional control and/or to compensate for perceived limitations in access to executive resources extends this discussion in positive ways. Investigating student self-reported strategy awareness and use is helpful to indicate the scope of the students' repertoire of strategies, as well as the strategies they do not use. Students may report they do not use specific strategies either because they are unaware of them, or they have determined that the strategies are not helpful.

Accordingly, the aim of the present research is to design and evaluate the construct validity of a self-report questionnaire that assesses students' awareness and use of cognitive, socio-emotional and behavioural strategies to control attention in instructional and social contexts in a university environment. The strategies probed are evidence-based in that research has shown that they hold promise for adult-students to optimize their control of attention in academic and social contexts. In particular, the self-report questionnaire is designed to inform future studies that investigate how university students, including students with ADHD or other neurodevelopmental disorders, select and self-regulate their use of these strategies. A psychometrically-validated questionnaire of strategy awareness and use has potential not only for the research community, counsellors, and coaches, but also for university students who may be

interested in exploring their use of evidence-based cognitive and behavioural strategies to optimize attentional control to improve learning and social/emotional regulation. In the remainder of the chapter, the strategies used in studies of CBT for university students with ADHD are discussed.

1.2. Psycho-Social Intervention Approaches

Difficulties in attentional control associated with resources in an executive system are thought to exist on a dimensional spectrum that spans from severe in the case of university students with ADHD, to less severe or intermittent among students without a diagnosis (Heidbredder, 2015). Therefore, it seems reasonable to assume that strategies empirically validated in the research as effective for university students with ADHD are also likely to benefit students with subclinical profiles who may also experience difficulties self-regulating academic and socio-emotional behaviours associated with executive functions.

Prior to their enrollment at a university, students with ADHD may have had access to school-based supports intended to help manage ADHD challenges associated with EF (Barkley, 2006). These are mainly external supports, such as individualized education plans in school, or parental and teacher monitoring. As students enter university, they must actively seek out their own resources. For students who present with a clinical diagnosis, universities are often able to provide academic accommodations such as extra time on tests and assignments, audio-recorded books, distraction-reduced test settings, and note-takers (Green & Rabiner, 2012). Gregg (2009) found that such services often offer a wide array of comprehensive educational accommodations to support performance in reading, writing, mathematics, time management, and completing exams. However, research has shown group-based CBT approaches that include identification of strategies to support control of attention and to compensate when attentional demands exceed EF capacity are effective to help university students become agents of their own learning.

In the following discussion, findings from the six studies identified by He and Antshell (2017) in their review of CBT for university students with ADHD, are further evaluated to identify cognitive, socio-emotional, and behavioural strategies that have potential to optimize or compensate for individual differences in an executive cognitive

system. As the three components of the EF system (working memory, set shifting, and inhibition) are not mutually exclusive and overlap, strategies developed to support one area of the executive system are also likely to benefit another. For this reason, the following strategies are discussed in relation to a general system of EF, and not specifically to its components. A focus is maintained on how these strategies support students with ADHD, who have been identified as having severely constrained access to this executive cognitive system.

1.2.1. Strategies to cope with distraction

Palmini (2008) reports that one of the main complaints of adults with ADHD who had previously attended university was difficulties with focusing attention. Difficulties with focusing attention can result in a decreased ability to inhibit distractions, often resulting in procrastination. Kwon, Kim, and Kawk (2018) found that even when university students with attention-related symptoms on the Adult ADHD Self-Report Scale started an assignment ahead of time, they still could not maintain concentration throughout the task. Students reported finding themselves staying up all night before an assignment was due to complete work or completing the majority of their studying the day before the exam. Students struggled to find an effective way to focus attention without resorting to reliance on time pressure caused by procrastination. In addition, participants also reported being unable to inhibit distractions and focus attention in class and instead found themselves wasting time by scribbling, going on their cell phones, taking bathroom breaks, or eating and drinking.

Accessing technological devices is often a major distraction for university students (Rosen et al., 2013). In a sample of university students with self-reported challenges in controlling attention, Wu (2017) found that students often check social media, shop online, send instant messages, surf the web, or make phone calls while trying to simultaneously complete assignments. Wu found social media usage is negatively correlated with higher task engagement as observed on measures of perceived attention problems and self-regulation strategies, even when university students claim they have sufficient ability to multitask. In fact, students also tend to overestimate their ability to “multitask,” causing them to engage in excessive “multitasking,” which ultimately results in decreases in task engagement and learning.

To manage these technological distractions, Wu (2017) found that reducing technological distractions by logging out of social media applications, reducing downloading speed, and avoiding unrelated tasks while completing assignments with the use of technology helps to increase students' task engagement. In Prevatt and Yelland's (2015) study of a CBT based intervention conducted over eight weeks with university students with ADHD, CBT coaches encouraged students to set aside time everyday to turn off mobile phones and computers for at least one hour. Additionally, students found it useful to create a detailed schedule each day to remain focused on tasks that need to be completed and avoid engaging in off task behaviours. Findings showed that incorporating these strategies into a daily routine resulted in increased focused attention, self-esteem, satisfaction with school, and decreased emotional distress.

1.2.2. Planning and organization

University students with ADHD have poorer time management (DuPaul et al., 2009), and organizational abilities (Weyandt et al., 2013) relative to their typically developing peers. Kwon et al. (2018) found that students with self-reported ADHD symptoms described a lack of daily structure in their lives left them feeling unsettled and with the impression that they had constantly wasted time. As this is a common problem for students with ADHD, CBT interventions often focus on improving students' organization of materials, schedules, and activities (Anastopoulus & King, 2015; Fleming et al., 2015).

Daily planner use has shown to be a helpful tool to improve students' planning and scheduling events and tasks (Anastopoulus & King, 2015; Fleming et al., 2015). In Anastopoulus and King's (2015) CBT intervention study, university students were encouraged to share tips with each other on how and when they used strategies such as the use of a daily planner. Students shared how they used daily planners to break down tasks into manageable steps, colour coding entries, blocking out time dedicated to studying in various ways to create a routine, and attached "to-do" lists directly into the daily planner. The researchers concluded that it is important for students to create planner entries that cue students to plan ahead for various events and activities.

Along with working on scheduling events and tasks, research has shown that students benefit from planning goals and organizing a feasible schedule to achieve both

short- and long-term personal and career-oriented objectives (Fleming et al., 2015; Swartz, Prevatt, & Proctor, 2005). Students experience the most success when goals are realistic (Anastopoulus & King, 2015), and when weekly goals are tied into long-term goals e.g., paying off financial debt, raising grade point average (GPA) (Swartz et al., 2005). Weekly goals are the most effective when easily attainable, measurable, observable, specific, reasonable, and motivating. Achieving small goals reinforces task-oriented behaviour and facilitates self-confidence and self-efficacy. During a CBT intervention designed by Swartz et al., students were advised by coaches to focus on no more than three goals at one time. Swartz et al. developed this heuristic after students reported that managing more than three goals proved to become overwhelming, especially for students who expressed difficulty with keeping a structured routine. Some students found it helpful to keep track of progress visually by charting progress.

Further, Kwon et al. (2018) found university students with self-reported attentional difficulties reported that they often had trouble prioritizing which task to complete first. Supporting students as they learn how to prioritize tasks has been a common focus in intervention research (Fleming et al., 2015; LaCount, Hartung, Shelton, Clapp, & Clapp, 2015; Swartz et al., 2005). In a CBT intervention study for university students with ADHD, Prevatt and Yelland (2015) found students were most successful when they wrote down a maximum of two tasks to complete throughout the day. With a maximum of two tasks, students were less likely to become overwhelmed by a long “to-do” list and were forced to prioritize tasks that needed to be completed first.

To improve organization of materials, Prevatt and Yelland (2015) suggest that students can end each day by organizing the clothing they plan to wear, arranging materials in their backpack, and packing and storing their lunch in order to create a routine for the next day. To organize important papers such as medical forms, credit card statements, and school loan papers, students were encouraged to use different coloured folders. Students were also encouraged to designate a location, such as a basket by their front door, for commonly misplaced items such as keys, wallet, and mobile phone.

1.2.3. Self-monitoring of reading comprehension

Palmini (2008) reported that adults with ADHD who had previously attended university noted they had trouble tracking and linking together the content of written texts. A CBT intervention found students benefit from asking questions about the main themes and ideas while completing course readings to make sure they are focused and engaged (He & Antshel, 2017). Some students also find it helpful to make connections with prior knowledge and self-question during readings. Scheithaur and Kelley (2017) implemented a self-monitoring intervention to help mitigate reading comprehension challenges in university students with ADHD. Strategies involved first surveying the text, writing down questions about the topic of the reading, then reading the text and answering these pre-generated questions as they go along (Scheithaur & Kelley). Upon completion, students practiced reciting the answers to these questions and reflected upon connections highlighted by the reading. As part of the intervention, students were also coached in the use of strategies to improve organization, self-assess comprehension, and minimize distraction. Relative to a group who only received informational handouts, students who received instruction on study skills, goal setting, and self-monitoring showed improvements in inattentive symptoms, test taking skills, and reading comprehension.

1.2.4. Social/emotional regulation strategies

University students with ADHD reportedly have difficulties controlling and regulating emotions; they tend to have lower levels of adjustment, social skills, and often experience lower levels of self-esteem compared to their typically developing peers (Shaw-Zirt, Popali-Lehane, Chaplin, & Bergman, 2005). Students with high levels of self-reported attentional difficulties report expressing extreme negative reactions towards difficult interpersonal issues and difficulty dealing with these negative emotions (Kwon et al., 2018). Moreover, these students often relied upon ineffective strategies to cope with this emotional volatility, such as hiding their emotions during conflicts or avoiding certain situations or people. As a result, students reported relationships were often lost and emotional outbursts that included screaming or yelling were increased.

Many interventions for university students with ADHD also include discussions about social and emotional strategies (Anastopoulus & King, 2015; Prevatt & Yelland,

2015; Swartz et al., 2005). This is an important area to apply strategies, as social and emotional competency in university students with ADHD is shown to be more predictive of life satisfaction than ADHD symptoms alone (Gudjonsson et al., 2009). Past intervention research has shown it is important to facilitate students' awareness of how their thought patterns affect their social relationships (Anastopoulus & King, 2015). It has also been found important to discuss relaxation techniques students can apply when they are feeling overwhelmed emotionally (e.g., listening to guided relaxation scripts; Swartz et al., 2005). Students benefit from learning a variety of relaxation techniques which allows them to better control impulses and anger management. Another helpful strategy is for students to write down what happened anytime they became anxious, including what they were thinking and how they reacted (Prevatt & Yelland, 2015). Students also found it useful to work on social relationships by practicing active listening, asking people to repeat themselves, using eye contact, and even carrying a small notebook to write down conversational points to follow up on later.

1.2.5. Self-motivation

Managing behaviours related to EF capacity limitations is challenging for students with ADHD. Therefore, initiating a system of self-rewards may be helpful for students to adhere to strategies identified as potentially beneficial. For example, Prevatt and Yelland (2015) found implementing a self-reward system was effective for university students with ADHD when combined with goal setting. In a CBT intervention study, Swartz et al. (2005) encouraged students to choose small rewards for meeting weekly goals, and larger rewards for completing long-term goals. Examples of rewards could be praise from their CBT coach or one hour of television. Other studies have encouraged students to use visualization of rewards (Solanto et al., 2010), or apply incentives such as self-reward or even impressing parents (Prevatt & Yelland, 2015). Swartz et al. (2005) recommend students keep a daily log to record progress and to write down reasons if goals were not completed. This exercise can assist students in recognizing patterns in their progress and circumstances that could offset goal completion.

1.3. Summary

Currently, a psychometrically validated measurement tool to assess university students' awareness and use of self-regulation and coping strategies to address capacity limitations in EF is not available to researchers, students, educators or counsellors. Yet, review of research on CBT therapies for university students with ADHD has identified a large scope of strategies that have potential to support students who find the attentional control demands of a university setting daunting. Strategies directly linked to moderating the EF demands can be grouped into three broad domains: planning and organization of activities and materials, self-monitoring of reading comprehension, and social-emotional regulation. Although self-motivation and reward systems are not theoretically associated with an executive system, use of rewards are likely to increase student motivation to use strategies that will optimize use of the executive system.

The remainder of the thesis is divided into three additional chapters. Chapter 2 provides a detailed overview of the construction of the self-report measure. Of specific interest is a discussion of the process of constructing items, including how the three broad domains of strategy use introduced in Chapter 1 are associated with behaviours identified by the BRIEF-A as connected to an executive cognitive system. Further, the iterative process of item review and evaluation is presented to create the first draft of 132 items on the Strategy Awareness and Use Questionnaire (SAUQ). Chapter 3 discusses details on how the sample was obtained, the materials used, and the data collection procedure. Chapter 3 also presents details of the validity study where the items were submitted to exploratory factor analysis to determine the final factor structure and the items to be included on the final version of the SAUQ. Also included are correlations with related measures to assess concurrent validity. A subsample of students who self-reported difficulties in attentional control were further examined to determine the discriminant validity of the SAUQ. Finally, Chapter 4 summarizes the aim of the SAUQ, it's construct, concurrent and discriminant validity, and how it might be used in research and clinical practice to support students with difficulties in attentional control related to executive functions.

Chapter 2.

Design of the Questionnaire

2.1. Overview

Chapter 2 will discuss each component of design undertaken to develop a measure of strategy use and awareness. First, a basis for the SAUQ design is provided. This section will discuss why the SAUQ was developed, the format chosen, and who the measure is intended for. Second, EF is defined as the construct of interest underlying the SAUQ; SAUQ items are developed to address EF capacity limitations. Third, scale development is discussed in relation to item selection and development, and response scale selection.

2.2. SAUQ Design

As discussed in Chapter 1, the goal of the study was to develop a questionnaire that measures student awareness and use of strategies to improve attentional control - the *Strategy Awareness and Use Questionnaire*. The SAUQ aims to capture how students monitor and control attention in their learning and social environments when executive function capacity is limited due to environmental and/or neurodevelopmental constraints. It is anticipated that the SAUQ will be used by counsellors, coaches, educators, and by university students themselves. The measure is expected to be a valuable asset for students to gain insight into the scope of their awareness and use of strategies to actively control attention.

The SAUQ was designed as a summated, self-report questionnaire. Questionnaire measures are a practical way to collect data; they can be used across different time periods and settings, they are efficient and straightforward to administer, and are simple to score and standardize (Lecavalier & Aman, 2005). Questionnaires can be reliable and valid measures when the test is constructed according to specific standards. The current measure is intended for students to complete independently, reflecting on their own past strategic behaviour to manage attentional demands in a university environment.

All university students at some time in their lives have experienced difficulties in accessing a system of executive cognitive resources and as a result have employed cognitive or behavioural strategies to moderate the negative effects of these constraints. The expectation is that all students may find knowledge on personal strategy use and awareness helpful, including students with neurodevelopmental disorders such as ADHD, who may present with more EF challenges (Merkt et al., 2015; Roth, et al., 2013).

The SAUQ items were designed based on intervention research for university students with ADHD, as it was assumed that strategies that are effective for students with more severe difficulties monitoring and controlling attention would also be effective for students whose difficulties with attentional control are less pervasive. Students with ADHD may find SAUQ strategies especially useful or necessary to implement. Types of strategy use and awareness should overlap between the general student population and the ADHD student population as EF challenges are widely distributed within the general population (Roth et al., 2013). Thus, this questionnaire was developed to measure the "range" of awareness and use of strategies that address EF issues experienced by the population of students with ADHD but that may occur at milder levels in the general population. Expressed in other words, the SAUQ has been designed to address strategy use and awareness across a wide range of executive functioning in a university student population.

The SAUQ places an emphasis on students' strategy awareness, rather than exclusively inquiring about their strategy use. Students may be aware of appropriate strategies that can be used to address EF related challenges but may not always follow through or use the strategy in the most efficient way. The SAUQ is not a strategy inventory per se, but rather used to gain insight into students' awareness and knowledge of appropriate strategy use to address specific challenges. Students who are unfamiliar with strategies to control attention in everyday life may find this measure helpful to identify new approaches that have promise to support them in navigating a university environment.

Clark and Watson (1995), Netemeyer, Bearden and Sharma (2003), Spector (1992), and Streiner and Norman (2003) have suggested empirically supported steps that have theoretical underpinnings to guide questionnaire development. These steps

were followed in the current research and include: defining the construct of interest, scale development (format, item development, scaling), test administration, and item analyses (item trimming, dimensionality, internal consistency), and scale validation.

2.3. Defining the Construct of Interest

Netemeyer et al. (2003) suggest test construction should be supported by a theoretical framework to guide a clear conceptualization of the construct. Recall that research suggests ADHD is at least in part related to EF capacity (Barkley, 1997). As mentioned earlier, EF is a higher-order system that regulates human cognition and behaviour (Miyake et al., 2000). Due to the relationship between ADHD and EF (Weyandt et al., 2013), the nine BRIEF-A sub-domains of EF were used to guide the development of strategies addressed by the SAUQ.

The BRIEF-A addresses the following EF domains: Inhibit, Shift, Emotional Control, Self-Monitor, Initiate, Working Memory, Plan/Organize, Task Monitor, and Organization of Materials. Although there is some degree of overlap among these behavioural domains (Roth et al., 2013), for the purpose of conceptual clarity, SAUQ strategies were aligned with specific domains during the initial stages of test construction.

Inhibit. Inhibition is defined narrowly by authors of the BRIEF-A as the ability to control impulses (Roth et al., 2005). Inhibiting impulses can take place on many levels, such as appropriately stopping unwanted verbal, attentional, or physical behaviours. The BRIEF-A assesses inhibition by including questions focused on distraction (e.g., “People say I am easily distracted”), controlling impulses (e.g., “I have problems waiting my turn”), and controlling hyperactive behaviours (e.g., “I tap my fingers or bounce my legs”). The SAUQ addresses these challenges by including strategies specifically to reduce distractions (e.g., “I limit my use of social media so that I do not get distracted”).

As discussed previously in Chapter 1, Wu (2017) found technological distraction as a common challenge to student attention in modern university settings. Wu found that students are often engaged in a variety of social media platforms, websites, and instant messaging services while trying to complete course work. As such, the SAUQ has also incorporated strategies that address technological distraction as well as technological

assistance (e.g., “I limit my time on social media,” “I use an organizational application(s) on my mobile phone”).

Shift. The ability to shift refers to one’s ability to switch between tasks or situations freely as the task demands change (Roth et al., 2005). The ability to think flexibly is especially important in aiding problem solving. Within this domain, the BRIEF-A assesses the ability to shift by addressing ease of task switching (e.g., “I have trouble changing from one activity or task to another”) and problem solving (e.g., “I have trouble accepting different ways to solve problems with work, friends or tasks”). The SAUQ addresses flexibility by including questions aimed at willingness to participate in problem solving strategies (e.g., “I ask friends for advice when faced with academic problems,” “I try to find new ways to focus my attention while studying”).

Emotional control. The term emotional control is used to reflect the ability to modulate emotional responses in an appropriate manner (Roth et al., 2005). The BRIEF-A includes questions addressing emotional control such as “I overact emotionally.” The SAUQ includes items surrounding emotional control strategies such as “before reacting, I stop to take a deep breath.”

Self-monitor. Self-monitoring is important in realizing the impact of one’s own behaviour (Roth et al., 2005). The BRIEF-A includes items that tap into self-monitoring challenges such as “when people seem upset with me, I don’t understand why” or “I talk at the wrong time.” The SAUQ includes strategies one may use when attempting to improve self-monitoring such as “I try to control my body language when talking to others.”

Initiate. The ability to initiate involves being able to start tasks without external persuasion and to independently generate ideas (Roth et al., 2005). Items assessing the ability to initiate on the BRIEF-A include “I have trouble getting started on tasks.” The SAUQ attempts to assess initiating strategies, although many different factors may relate to this. One strategy may be using reward to motivate oneself to start a task (e.g., “I reward myself as I complete parts of an assignment or project”) or dividing tasks into smaller parts to make tasks less daunting (e.g., “I break up a large task into smaller parts”).

Working memory. Working memory is commonly conceptualized as the ability to update, add, delete, or hold relevant information in mind during completion of a task (Roth et al., 2005). On the BRIEF-A, working memory is assessed by items aimed at forgetfulness and short attention span (e.g., “I have trouble remembering things, even for a few minutes (such as directions, phone numbers),” “I have a short attention span”). The SAUQ involves strategies such as keeping lists that may help working memory challenges (e.g., “I keep a list of tasks I need to do throughout the day so that I don’t forget”).

Plan/organize. Planning and organizing encompasses a large range of behaviours including the ability to plan ahead, create achievable short-term and long-term goals, organize information, and carry out tasks in a timely and systematic manner (Roth et al., 2005). The BRIEF-A addresses many organizational and planning challenges such as “I have problems organizing activities” or “I don’t plan ahead for tasks.” The SAUQ inquires on the frequency of organizational strategies such as “I use a daily planner or calendar.”

Task monitor. Task monitoring requires an individual to assess task performance during or after an activity to improve performance (Roth et al., 2005). On the BRIEF-A, task monitoring is assessed with items inquiring about the frequency in which individuals experience challenges such as editing work for errors (e.g., “I don’t check my work for mistakes”). The SAUQ includes many items addressing strategies involving editing or using feedback to improve the quality of assignments (e.g., “I ask someone to proofread my work before I submit it,” “If I receive a poor grade, I make sure I understand why”).

Organization of materials. Organizing materials in an efficient manner enables individuals to keep work and living places tidy and to keep task materials in order (Roth et al., 2005). The BRIEF-A includes items assessing tidiness and organization of materials (e.g., “I don’t pick up after myself,” “I leave my room or house a mess”). The SAUQ focuses on strategies designed to improve organization of school materials and study spaces (e.g., “I create places to keep important school materials so that I do not lose them,” “I keep my work place tidy to stay organized”).

Although these domains are useful in guiding the creation of the SAUQ, strategy use and awareness cannot ultimately be captured by any one index attempting to represent the full scope of strategies students may apply. Strategy use and awareness likely represents the dynamic interplay between many inter-related factors as students adapt to attentional demands in the environment (Merkt et al., 2015; Toplak, Bucciarelli, Jain, & Tannock, 2008). However, the BRIEF-A provides a starting point to measure at least some very important domains of functioning within an academic environment. Thus, the SAUQ was built to measure major themes that arise in the literature applicable to attentional control in an academic setting in an attempt to assess a students' level of strategy use and awareness.

2.4. Scale Development

2.4.1. Item selection

Once a theoretical framework has been established to guide test construction and construct definition, items must be created to represent each domain. Many items were adapted from the literature on psychosocial interventions for adults with ADHD to include on the questionnaire. Original items were also generated to address EF capacity limitations highlighted on the BRIEF-A and in response to suggestions from focus groups including students with and without ADHD, educational professionals, and graduate students knowledgeable on the topic. As focus groups reviewed the questionnaire, items were dropped, added, or reworded. Items were removed if they were found to be confusing, poorly worded, or redundant.

Initially, a list of 123 items were administered to two focus groups, the first focus group included seven students with and without self-reported attentional issues. The second focus group included two graduate students who are familiar with learning strategies and two elementary school teachers. Raters were given general descriptions of EF domains and were asked to edit for grammar, suggest additional items, modify items, and suggest items for deletion. Two items were deleted because the item was considered vague or confusing, 11 items were added to cover strategies not mentioned that reviewers felt were important, and 56 items were reworded based on feedback from focus groups. A total of 132 items were included on the first draft of the SAUQ (see Appendix A).

2.4.2. Quantifying response options

Streiner and Norman (2003) suggest either a 5-point or 7-point response scale to measure latent constructs. If a smaller response scale is used such as a 3-point response scale, limited response categories may affect participant responses in which case the instrument becomes less reliable and precise. If more than a 7-point response scale is used, responding may become overwhelming to raters, while still failing to increase reliability and validity. A 5-point response scale was chosen as this number of response items is generally deemed acceptable when enough items are included to represent the domain of interest (Netemeyer et al., 2003). Response options on the SAUQ were designed to assess the frequency in which students self-reported use and awareness of specific strategies (i.e., “Never”, “Rarely”, “Sometimes”, “Often”, “Always”).

2.5. Summary

Steps were followed to ensure empirically supported questionnaire development. First, the construct of interest was defined guided by the theoretical underpinnings of the BRIEF-A. Second, items were adapted from the ADHD university student CBT literature to create an initial pool of items to be reviewed by focus groups. Third, focus groups reviewed items and suggested item modifications, deletions, and additions. Lastly, a 5-point frequency scale was selected to measure items. Once the first draft of the SAUQ was completed, the aim was then to refine the measure through item analysis, and subsequently, assess its construct, concurrent, and discriminant validity. Accordingly, the following chapter describes this process.

Chapter 3.

Analyses of SAUQ Items and Scales

3.1. Overview

In this chapter, a review of the procedures used to assess the psychometric properties of individual items and scales on the SAUQ is presented. First, recruitment of participants, participation criteria, and sample characteristics are presented. Second, materials chosen for the study and study procedures are discussed. Third, participant data on the initial 132 items were submitted to a preliminary item analysis. Items were removed from the measure if they demonstrated skewed responding. Items were then submitted to exploratory factor analysis (EFA) to determine dimensionality of the SAUQ. Lastly, the measure was then assessed for internal consistency, concurrent, and discriminant validity.

3.2. Study Participants

This study was reviewed and approved by both the UBC and SFU Research Ethics Boards. A table was set up at SFU learning commons and in the hallway of the UBC Student Union building with a sign inviting students to participate in the study. Students were given information about the study purpose, how long the questionnaire would take to complete, and their compensation for the time it took them to fill out the questionnaires. Upon completion students could choose between receiving a chocolate bar or sign up to be entered into a draw for a $50 Starbucks gift card as compensation. Students in three third year Education classes at SFU were also recruited. All students who consented to participate in the study completed the questionnaires and provided demographic information.

The questionnaires selected for further analysis were completed by students who met the following inclusion criteria: 1) their age fell between 18 and 35 years; 2) they lived in Canada for 3 or more years; 3) their self-reported English language proficiency was sufficient to read the items. An initial sample of 185 undergraduate and graduate students consented to complete the study. In total, 37 (20.00%) of these 185 participants

were excluded from the sample for the following reasons: participants had not lived in Canada for 3 or more years (n = 4); participants were older than 35 years of age (n = 4); information was missing from either the demographic questions (e.g., birth date, gender) or item ratings (n = 3); scores were elevated on the CAARS inconsistency scale (n = 18), the BRIEF-A inconsistency scale (n = 6), the BRIEF-A infrequency scale (n = 1), or the SAUQ inconsistency scale (n = 1). Overall, 148 participants were included in the final analysis.

Sample characteristics are reported in Table 3.1. The mean age of participants was 22.44 years (SD = 3.79; Range = 18-35). The final sample included 107 (72.30%) females and was ethnically diverse: 38.38% European Canadian; 19.46% Chinese; 8.11% South Asian; 3.78% South East Asian; 3.24% Filipino; 3.78% Latin American; 1.62% Japanese; and 8.11% other. The sample included 134 (90.54%) undergraduates and 14 (9.46%) graduate students. Self-reported GPA was 3.19 (SD = 0.46; Range = 2.00-4.20) among undergraduates and 3.99 among graduate students (SD = 0.31; Range 3.30-4.33). Sample performances on the CAARS and BRIEF-A are shown in Table 3.2 as standardized scores.

Table 3.1. *Sample Description*

Sample Characteristics	N (% of total sample)
Age	
18-25 years	122 (82.43)
26-35 years	26 (17.57)
Educational Program	
Arts and Social Sciences	36 (24.32)
Education	33 (22.30)
Science	34 (23.00)
Environment	9 (6.08)
Communications	2 (1.35)
Business	13 (8.78)
Health Science	9 (6.08)
Applied Sciences	5 (3.38)
Other	7 (4.73)
Residency	
Canadian Citizenship	134 (90.54)
Student Visa	6 (4.05)
Permanent Residence	8 (5.41)

Note. Total sample N=148.

Forty-nine students self-reported levels of inattention and memory problems on the CAARS that according to the CAARS administration manual fell within the sub-clinical to clinically significant range (T-score ≥ 60); however, only five students self-reported having been diagnosed with ADHD. Five students had been prescribed stimulants to reduce ADHD symptomatology, four of which had reported having a diagnosis. Additionally, 8 (5.41%) students in the sample self-reported a diagnosis of generalized anxiety disorder (GAD), 12 (8.11%) self-reported a diagnosis of major depressive disorder (MDD), and an additional 7 (4.73%) self-reported a comorbid diagnosis of both GAD and MDD. Four participants had complex diagnostic profiles that included ADHD and at least one other diagnosis (generalized anxiety disorder, major depressive disorder, or mood disorder).

Table 3.2. *Sample Performance on CAARS and BRIEF-A*

	M	SD	Range
CAARS			
Inattention/Memory Problems	54.86	12.14	35-86
Hyperactivity/Restlessness	52.86	10.26	29-78
Impulsive/ Emotional Lability	47.14	7.90	36-77
Problems with Self-Concept	51.49	10.84	15-76
ADHD Index	52.68	10.14	32-85
BRIEF-A			
Inhibit	54.34	10.25	36-84
Shift	54.86	10.33	39-90
Emotional Control	52.56	10.41	38-83
Self-Monitor	49.50	10.90	37-89
Initiate	56.04	12.13	37-89
Working Memory	58.26	11.58	39-93
Plan/Organize	54.30	10.97	38-86
Task Monitor	56.39	11.02	36-86
Organization of Materials	50.93	11.03	19-81
Behavioural Regulation Index	53.53	9.74	35-88
Metacognition Index	55.90	11.29	35-85
Global Executive Composite	55.37	10.59	34-87

Note. All mean scores reported in the table are standardized T-scores (M = 50, SD =10).

3.3. Materials

Conners' Adult ADHD Rating Scale (CAARS). The CAARS is a 26 item self-report questionnaire that measures the presence and severity of ADHD symptoms in adults 18 years and older (Conners et al., 1999). The CAARS is comprised of four scales; Inattention/Memory Problems, Hyperactivity/Restlessness, Impulsivity/Emotional Lability, and Problems with Self-Concept. Additionally, the CAARS also includes an overall ADHD Index and an inconsistency scale. Clinically significant scores are indicated with T-scores ≥ 65.

Psychometric research evaluating validity and reliability of the CAARS have demonstrated acceptable internal reliability, yielding coefficient alphas ranging from 0.86 to 0.92 for the four scales. Research also suggests acceptable test-retest reliability correlations of 0.88 ($p < 0.05$) for Inattention/Memory Problems, 0.90 ($p < 0.05$) for

Hyperactivity/Restlessness, 0.90 ($p < 0.05$) for Impulsivity/Emotional Lability, and 0.91 ($p < 0.05$) for Problems with Self-Concept (Erhardt et al., 1999).

Behaviour Rating Inventory of Executive Functioning – Adult Version (BRIEF-A). The BRIEF-A measures adults' self perceptions of EF regulation challenges in everyday life (Roth et al., 2005). The BRIEF-A is comprised of 75 items measuring nine subscales: Inhibit, Shift, Emotional Control, Self-Monitor, Initiate, Working Memory, Plan/Organize, Task Monitor, and Organization of Materials. Each scale is scored on a 3-point Likert scale with a higher score indicating more problems with executive functioning. The test yields a total score for the Global Executive Composite (GEC) scale and sub-scores for two broader scales; the Behavioural Regulation Index (BRI) (Inhibit, Shift, Emotional Control, and Self-Monitor) and the Metacognition Index (MI) (Initiate, Working Memory, Plan/Organize, Task Monitor, and Organization of Materials). Three validity scales are also included: Negativity, Infrequency, and Inconsistency. Clinically significant scores are indicated with T-scores ≥ 65.

Psychometric research evaluating reliability and validity have demonstrated acceptable internal consistency, yielding coefficient alphas ranging from 0.73 to 0.90 for the BRI and MI scales (Roth et al., 2005). Test-retest reliability was also evaluated, resulting in a range of 0.82 to 0.93 over a 4-week period. In a test of content validity, one study uncovered average inter-rater agreement ranging from 35% to 98%.

Demographic questionnaire. A demographics questionnaire was developed to collect basic information as well as language proficiency, level of education, and health information (see Appendix B). Since the CAARS is used primarily as a screening tool rather than to confirm diagnoses, participants were also asked to report if they had received a prior diagnosis or had ever been prescribed stimulant medication to reduce ADHD symptomatology.

Strategy Awareness and Use Questionnaire (SAUQ). This questionnaire was developed to assess areas of strategy use and awareness within a multidimensional framework amongst university students. The first version of the measure submitted to analysis included 132 items. Participants were asked to rate the frequency in which they endorsed strategy items on a Likert scale ranging from 1 ("Never") to 5 ("Always").

Higher scores reflect higher use and awareness of strategies. The SAUQ also includes a six item inconsistency scale.

3.4. General Procedures

Participants were asked to fill out a demographic questionnaire including information on education, language, and health; a questionnaire self-reporting the presence of ADHD symptomatology (CAARS); a measure of executive functioning (BRIEF-A); and the newly developed questionnaire measuring student awareness and use of strategies reflecting attentional control (SAUQ). Booklets containing these research materials were provided to students to complete. Participation in the study took approximately 20-40 minutes. The consent forms were stored in a separate folder and participants were assigned a numerical subject code on all research materials.

Data was entered into excel and stored on a password protected computer. Data collected was anonymized and no list was retained that linked personal identifying information to the data. The data was kept in a locked cabinet at SFU. The data will be deleted from computers and written copies will be destroyed after 10 years. After this period of time, it is current best practice to upload data to an electronic open access initiative. Open access initiatives allow data from completed studies to be available to researchers to further utilize and explore. The data from the current study will be uploaded to the SFU Vault without any identifiers to ensure confidentiality. The data will be stored on the SFU Vault for an indefinite amount of time.

3.5. SAUQ Item Analysis

3.5.1. Item trimming

Although the weighted least squares with mean and variance-adjusted estimator (WLSMV) used for analysis is compatible with ordinal data, highly skewed items may bias the analyses used to evaluate the measure. Items were reviewed for floor and ceiling effects, skew and kurtosis. According to Streiner and Norman (2003), highly skewed responses should be considered for elimination since most individuals respond similarly. After analysis, 20 items were removed on the basis of ceiling effects (M = > 3.70). No items exhibited floor effects. Seven items with ceiling effects were retained for

further analysis as previous research has shown that these strategies are highly effective for students with ADHD symptomatology. After item trimming, 112 items were kept for further analysis.

3.5.2. Dimensionality

An assessment of dimensionality provides information on construct validity. Construct validity is used to determine the degree to which the measure taps the theory it is intended to assess. In this case, the theoretical construct of interest was executive functioning. The questionnaire was intended to measure student awareness and use of strategies to compensate for neurobiological or environmental constraints in executive functions. The dimensionality of the measure was assessed by performing exploratory factor analysis using Mplus (Muthén & Muthén, 2011) and the WLSMV estimator. WLSMV is the preferred estimator for ordinal data because it does not assume a normal distribution (Brown, 2014). EFA is an unrestricted factor model that estimates underlying dimensionality of an observed set of variables (Garrido, Abad, & Ponsoda, 2016). Due to its unrestricted nature, EFA can be used to discover whether a specified number of common factors account for the covariation among a set of observed variables. In this process, indicators are allowed to load freely on all factors. An oblique (GEOMIN) rotator was used to allow factors to correlate with each other.

Examination of the scree plots and eigenvalues suggested a solution with 7-9 factors could be appropriate. Fit indices were used to assess acceptable model fit. The root mean square error of approximation (RMSEA) is a measure of misfit detectability related to the model's proximity to the objective truth in the population (Garrido, Abad, & Ponsoda, 2016). Lower values suggest a better fit to the data. The literature suggests RMSEA values less than 0.05 reflect acceptable fit to the data (Garrido, Abad, & Ponsoda, 2016). The comparative fit index (CFI) and the Tucker-Lewis index (TLI) were used to measure the superiority of the specified factor model compared to an alternative null model in which observed variables are uncorrelated. CFI is bounded by 0 and 1 where higher values indicate better fit compared to the null model. TLI is unbounded and measures reduction in misfit per degree of freedom. Values greater than 0.90 suggest acceptable fit to the data (Garrido, Abad, & Ponsoda, 2016). Standardized root mean square residual (SRMR) was also used to assess model of fit. SRMR reports on the standardized difference between the observed and model-implied covariance matrices.

This fit statistic can be used for categorical variable estimators when covariances in the formula are substituted with polychoric correlations and standard deviations are replaced by standardized values in unity. With a lower bound of zero, lower values suggest better fit. The literature suggests values smaller than 0.08 reflect good fit (Garrido, Abad, & Ponsoda, 2016).

In the initial analysis, a nine-factor solution produced estimates that suggested this model was the best fit (RMSEA = 0.03, CFI = 0.99, TLI = 0.99, SRMR = 0.02, X^2 (297) = 436.44, *p* = 0.01). However, two factors had less than four items with factor loadings greater than 0.40. Therefore, the seven-factor model was determined as the most appropriate model, because unlike the eight- and nine-factor models, each factor contained at least four items with loadings greater than 0.40 (RMSEA = 0.05, CFI = 0.99, TLI = 0.98, SRMR = 0.03, X^2 (238) = 587.18, *p* = 0.00). Although the Chi-Square fit statistic suggested poor fit for the seven-factor solution, Chi-Square is shown to produce overly high rejection rates, especially with ordinal data (Garrido, Abad & Ponsoda, 2016). The seven-factor solution resulted in 37 items. Item loadings on factors ranged from 0.43 to 0.96.

The seven-factor model was further modified so that the final version of the SAUQ consisted of 35 items, with five items on each of the seven scales (see Appendix C). This was done so that a composite score could be calculated where each factor was equally weighted. The final version of the SAUQ was resubmitted to exploratory factor analysis for 6, 7, and 8 factor models. As shown in Table 3.3, an eight-factor model seemed to have the best fit, but once again one factor had less than four items that loaded > 0.40. A seven-factor model was evaluated as the most appropriate model (RMSEA = 0.04, CFI = 0.99, TLI = 0.99, SRMR = 0.03, X^2 (371) = 449.79, *p* = 0.00). Table 3.4 shows item cross loadings on each factor.

Table 3.3. *Model of Fit for Alternative Factor Models of SAUQ Evaluated by EFA*

Factor Model	$X^2(df)$	RMSEA (90% CI)	CFI	TLI	SRMR
One-factor model (35 items)	3924.30 (560) (p = 0.00)	0.19 (0.18-0.19)	0.66	0.64	0.24
Six-factor model (35 items)	738.97 (400) (p = 0.00)	0.07 (0.06-0.08)	0.97	0.95	0.05
Seven-factor model (35 items)	449.79 (371) (p = 0.00)	0.04 (0.02-0.05)	0.99	0.99	0.03
Eight-factor model (35 items)	383.13 (343) (p = 0.07)	0.03 (0.00-0.04)	0.99	0.99	0.02

Note. X^2: Chi-Square; RMSEA: Root Mean Square Error of Approximation; CFI: Comparative Fit Index; TLI: Tucker-Lewis Index; SRMR: Standardized Root Mean Square Residual.

A one factor model was also evaluated to determine covariances among items that were included in the seven-factor model. With the exception of six items, all item loadings were greater than 0.40; however, the model does not reflect sufficient fit (RMSEA = 0.19, CFI = 0.66, TLI = 0.64, SRMR = 0.24, X^2 (560) = 3924.30, p = 0.00).

Table 3.4. *Item Cross-Loadings on a Seven-Factor Solution*

Item	Comp M	Plan/ Org	SReward	Self Reg	OrgTech	DistM	Org Mats
While doing course readings, I ask myself questions about the main ideas	**0.81***	0.03	-0.04	0.00	-0.03	0.09	0.01
After completing assigned readings, I summarize the main points	**0.76***	0.03	0.04	0.04	-0.06	0.05	-0.07
While I do course readings, I pick out the main points	**0.84***	-0.04	0.06	-0.04	0.02	-0.11	-0.04
While reading, I ask myself what the main themes and ideas of the course text are	**0.90***	-0.23*	-0.08	0.03	0.04	-0.04	0.05
I ask myself questions while reading a text to ensure I understand the main concepts	**0.79***	0.03	0.02	0.08	0.00	0.04	0.04
I use a daily planner or calendar to organize appointments	-0.02	**0.89***	0.00	0.02	0.05	-0.15*	0.01

Item	Comp M	Plan/ Org	SReward	Self Reg	OrgTech	DistM	Org Mats
I use a daily planner or calendar to organize social commitments	0.00	**0.85***	-0.02	-0.01	0.05	-0.03	-0.04
I use a daily planner or calendar to organize school commitments	0.04	**0.88***	-0.02	0.06	0.04	0.00	0.06
I write down a list of tasks I need to do throughout the day	0.00	**0.61***	0.07	0.03	-0.10	0.17*	0.22*
I use a daily planner or calendar to organize work commitments	-0.03	**0.94***	-0.02	0.00	0.02	0.02	0.00
I reward myself as I complete parts of an assignment or project	-0.01	0.09	**0.90***	-0.09	-0.02	0.05	-0.01
I reward myself to stay motivated during a task	-0.01	-0.02	**0.95***	0.11	0.02	0.02	-0.09
I reward myself after completing a course reading	0.10	0.20*	**0.77***	-0.04	0.05	-0.03	-0.01
I set up a reward system to stay focused during a task	0.08	0.02	**0.85***	0.00	0.02	0.06	0.10
After completing a term assignment or project, I reward myself	-0.11	-0.13	**0.82***	0.25*	-0.05	-0.09	0.06
If I receive a poor grade, I make sure I understand why	0.01	-0.16*	-0.06	**0.84***	0.06	0.01	0.01
I ask for advice when I don't know what to do	0.06	0.01	-0.02	**0.52***	-0.02	-0.03	0.04
I contact or go to an instructor's office hours when I need help	0.14	0.10	0.08	**0.43***	-0.04	0.09	0.02
I read and use constructive feedback given to me on assignments and tests	0.11	0.17*	0.09	**0.54***	0.02	-0.14	0.09
I make sure I understand why marks were deducted so that I can do better next time	-0.01	0.06	0.00	**0.96***	0.02	0.05	-0.11

Item	Comp M	Plan/ Org	SReward	Self Reg	OrgTech	DistM	Org Mats
I use a mobile phone application(s) to keep track of appointments	-0.07	0.03	-0.03	0.13*	**0.83***	0.02	-0.03
I use a mobile phone application(s) to keep track of assignment deadlines	0.04	-0.05	0.00	0.01	**0.95***	0.04	-0.03
I use a mobile phone application(s) to keep track of social commitments	-0.05	0.02	0.02	0.03	**0.89***	-0.01	0.01
I use a mobile phone application(s) to keep track of school commitments	0.06	0.00	0.03	0.01	**0.92***	0.02	0.07
I use a mobile phone application(s) to keep track of work commitments	0.01	0.13*	0.00	-0.06	**0.85***	-0.04	0.03
While working on the computer, I avoid visiting websites that are irrelevant to my learning for my project or studies	0.12	0.06	-0.17*	0.10	-0.04	**0.48***	0.15
I turn off sound notifications from my digital devices while studying	-0.01	-0.08	0.06	-0.01	0.03	**0.81***	-0.02
I turn off visual notifications from my digital devices while studying	0.02	0.08	0.03	-0.03	-0.03	**0.83***	-0.02
I limit the number of social media applications that I use	0.21*	-0.01	0.03	-0.04	0.07	**0.52***	0.10
I put my mobile phone away while studying to make sure I stay on task	-0.06	-0.06	-0.07	0.04	0.06	**0.72***	0.22*
I have a tidy place to do my work	0.03	-0.08	0.01	0.10	0.03	-0.01	**0.73***
I work in a tidy area so that I can think clearly	0.04	0.05	-0.04	-0.09	0.05	0.03	**0.87***
I set up my study space so that I have everything I need to stay focused	0.04	0.06	0.04	0.05	0.02	0.02	**0.66***
I keep my workplace tidy to stay organized	-0.01	0.12	0.01	0.06	-0.05	0.02	**0.88***

Item	Comp M	Plan/ Org	SReward	Self Reg	OrgTech	DistM	Org Mats
I take time to set up my study space	-0.05	-0.06	0.02	-0.10	0.01	0.00	**0.78***

Note. *Factor loading is significant at the 0.05 level. CompM: Comprehension Monitoring; Plan/Org: Planning/Organization; SReward: Self-Reward; SelfReg: Self-Regulation; OrgTech: Organization with Mobile Phone Technology; DistM: Distraction Management; OrgMats: Organization of Materials.

Table 3.5 shows that item loadings on all seven factors ranged from 0.43 to 0.96. Review of the items that loaded on each factor suggested the following domains were represented: Comprehension Monitoring, Planning/Organization, Self-Reward, Self-Regulation, Organization with Mobile Phone Technology, Distraction Management, and Organization of Materials.

Table 3.5. *Factor Loadings for a Seven-Factor Solution*

Factor 1 – Comprehension Monitoring	Factor Loading
While doing course readings, I ask myself questions about the main ideas	0.80
After completing assigned readings, I summarize the main points	0.76
While I do course readings, I pick out the main points	0.84
While reading, I ask myself what the main themes and ideas of the course text are	0.90
I ask myself questions while reading a text to ensure I understand the main concepts	0.79
Factor 2 – Planning/Organization	
I use a daily planner or calendar to organize appointments	0.89
I use a daily planner or calendar to organize social commitments	0.85
I use a daily planner or calendar to organize school commitments	0.88
I write down a list of tasks I need to do throughout the day	0.61
I use a daily planner or calendar to organize work commitments	0.94
Factor 3 – Self-Reward	
I reward myself as I complete parts of an assignment or project	0.90
I reward myself to stay motivated during a task	0.95
I reward myself after completing a course reading	0.77
I set up a reward system to stay focused during a task	0.85
After completing a term assignment or project, I reward myself	0.82

Factor 4 – Self-Regulation	
If I receive a poor grade, I make sure I understand why	0.84
I ask for advice when I don't know what to do	0.52
I contact or go to an instructor's office hours when I need help	0.43
I read and use constructive feedback given to me on assignments and tests	0.54
I make sure I understand why marks were deducted so that I can do better next time	0.96
Factor 5 – Organization with Mobile Phone Technology	
I use a mobile phone application(s) to keep track of appointments	0.83
I use a mobile phone application(s) to keep track of assignment deadlines	0.95
I use a mobile phone application(s) to keep track of social commitments	0.89
I use a mobile phone application(s) to keep track of school commitments	0.92
I use a mobile phone application(s) to keep track of work commitments	0.85
Factor 6 – Distraction Management	
While working on the computer, I avoid visiting websites that are irrelevant to my learning for my project or studies	0.48
I turn off sound notifications from my digital devices while studying	0.81
I turn off visual notifications from my digital devices while studying	0.83
I limit the number of social media applications that I use	0.52
I put my mobile phone away while studying to make sure I stay on task	0.72
Factor 7 – Organization of Materials	
I have a tidy place to do my work	0.73
I work in a tidy area so that I can think clearly	0.87
I set up my study space so that I have everything I need to stay focused	0.66
I keep my work place tidy to stay organized	0.88
I take time to set up my study space	0.78

Note. $p < 0.05$ for all factor loadings.

3.6. Scoring the SAUQ

Based on EFA, users are justified in producing summated scores of the seven subscales: Comprehension Monitoring, Planning/Organization, Self-Reward, Self-Regulation, Organization with Mobile Phone Technology, Distraction Management, and Organization of Materials. Users may also produce a summated total score (SAUQ Global Index) as each item or strategy is given equal weight in creating a total score.

3.7. Reliability of Scales

Currently, a generally accepted reliability index for factors estimated with ordinal data submitted to an EFA is not available. Psychometricians have for many years, criticized what they view as an overwhelming and puzzling over-emphasis on Cronbach's alpha reliability (e.g., Sijtsma, 2009; see Dunn, Baguley, & Brunsden, 2014). It is proposed that using an omega coefficient (McDonald, 1999) may be an appropriate alternative to Cronbach's alpha in conditions where: i) all items have at least 5 response options on an ordinal scale, (ii) there's no piling of responses at the smallest or largest category for an item, and (iii) there is no appreciable clustering effect of the studied subjects (cases). As the SAUQ items met these conditions, an omega coefficient was calculated for factors on the EFA solution. Omega coefficients greater than the criterion of 0.70 were found for each scale: Comprehension Monitoring: 0.89 (95% [0.85, 0.91]); Planning/Organization: 0.92 (95% [0.88, 0.94]); Self-Reward: 0.92 (95% [0.90, 0.94]); Self-Regulation: 0.80 (95% [0.74, 0.84]); Organization with Mobile Phone Technology: 0.94 (95% [0.92, 0.96]); Distraction Management: 0.82 (95% [0.75, 0.86]); Organization of Materials: 0.88 (95% [0.84, 0.90]). Taken together, these results suggest acceptable reliability for each subscale.

3.8. Concurrent Validity

Concurrent validity (the degree to which the SAUQ relates to measures tapping relevant constructs of interest; EF and attention) was evaluated by correlating factor scores on the SAUQ with two independent measures: a measure of adult ADHD behaviours (CAARS); and a measure of adult executive functioning (BRIEF-A). The association between the CAARS Inattention/Memory Problems subscale and the BRIEF-A GEC showed a strong relationship ($r = 0.81$; $p < 0.01$), which affirmed that for this sample of university students, elevated levels of inattention symptoms are related to an increase in behaviours associated with limitations in EF capacity.

Table 3.6 describes the pattern of correlations that were computed to examine concurrent validity of the SAUQ in relation to the BRIEF-A GEC and the CAARS Inattention/Memory Problems subscales. To examine the relationship between overall strategy use and awareness and overall executive functioning, a correlation was computed between the SAUQ Global Index (SAUQ GI) and BRIEF-A GEC. Results

revealed a weak negative relationship (r = -0.29; $p < 0.01$), which suggests higher levels of EF capacity limitations in students are associated with lower levels of strategy use to address these behaviours.

A correlation was also computed for the two composite scales included in the BRIEF-A: Behavioural Regulation Index (BRI) (Inhibit, Shift, Emotional Control, and Self-Monitor); and the Metacognition Index (MI) (Initiate, Working Memory, Plan/Organize, Task-Monitor, and Organization of Materials). Results revealed a moderate negative relationship between the SAUQ GI score and the BRIEF-A MI (r = -0.36; $p < 0.01$). The relationship between the SAUQ GI scale and BRIEF-A BRI was not statistically detectible. Taken together, there is preliminary evidence to suggest that increased use of SAUQ strategies are associated with an increase in metacognitive behaviours.

Table 3.6. *Correlations Between the SAUQ and BRIEF-A, CAARS, GPA*

Domain	BRIEF-A GEC[1]	CAARS Inattention/Memory	GPA[2]
SAUQ Global Index	-0.29*	-0.37*	0.12
SAUQ Comprehension Monitoring	-0.23*	-0.28*	0.05
SAUQ Planning/Organization	-0.28*	-0.33*	0.05
SAUQ Self-Reward	0.02	0.01	-0.13
SAUQ Self-Regulation	-0.38*	-0.38*	0.27*
SAUQ Organization with Mobile Phone Tech.	-0.10	-0.07	0.10
SAUQ Distraction Management	-0.10	-0.10	0.16
SAUQ Organization of Materials	-0.27*	-0.36*	0.04

Note. *Correlation is significant at the 0.01 level; [1] BRIEF-A GEC: BRIEF-A Global Executive Composite; [2] GPA correlation computed with n = 118 due to missing data.

To further evaluate concurrent validity, the SAUQ subscales were correlated with the BRIEF-A GEC to evaluate if specific domains of strategy use and awareness are related to students' EF-related behaviour. The results were as follows: weak to moderate correlations were obtained between the BRIEF-A GEC and Comprehension Monitoring

(r = -0.23; $p < 0.01$); Planning/Organization (r = -0.28; $p < 0.01$); Self-Regulation (r = -0.38; $p < 0.01$); and Organization of Materials (r = -0.27, $p < 0.01$). These relationships suggest increased levels of behaviours indicative of capacity limitations in executive function are related to lower levels of strategy use and awareness in the domains of comprehension monitoring, planning and organization, self-regulation, and organization of materials. Students whose everyday behaviours indicate either EF capacity constraints or difficulties in processing in an EF system may not implicitly use strategies to compensate for these difficulties. In this case, awareness of strategies is likely not sufficient alone to support students. They will also need to know how to implement the strategy in a way that is personally meaningful and motivating for them. The relations between the following subscales and executive functioning behaviours was not statistically detectible (all p's > 0.01): Self-Reward (r = 0.02); Organization with Mobile Phone Technology (r = -0.10); and Distraction Management (r = -0.10). These strategies may be effective at increasing student motivation; however, they do not appear to be directly related to the executive cognitive system.

To determine if a relationship existed between overall strategy use and awareness and inattention/memory difficulties, a correlation was computed for the SAUQ GI scale and the CAARS Inattention/Memory Problems scale. Results showed a moderate negative relationship that was statistically detectible (r = -0.37; $p < 0.01$). This relationship suggests increased levels of inattention in everyday life are associated with lower levels of overall strategy use and awareness. A weak negative relationship was also found between SAUQ GI scale and the CAARS Problems with Self-Concept scale (r = -0.27; $p < 0.01$), suggesting a strong, positive self-concept is associated with awareness and implementation of strategies.

Next, the SAUQ subscales were correlated with the CAARS Inattention/Memory Problems scale. The results were as follows: weak to moderate correlations were obtained between the CAARS Inattention/Memory Problems scale and Comprehension Monitoring (r = -0.28; $p < 0.01$); Planning/Organization (r = -0.33; $p < 0.01$); Self-Regulation (r = -0.38; $p < 0.01$); and Organization of Materials (r = -0.36, $p < 0.01$). Taken together, these results suggest students who report they experience increased levels of inattention in their daily lives are less likely to use strategies associated with comprehension monitoring, planning and organization, self-regulation, and organization of materials to compensate for these relative difficulties in inattention/memory. The

following subscales did not demonstrate a significant relationship with inattention (p > 0.01): Self-Reward (r = 0.01); Organization with Mobile Phone Technology (r = -0.07); and Distraction Management (r = -0.10). Students' level of attention and memory was not associated with their strategy use, which suggests these are strategies that may be effective universally across students with different attentional/memory profiles.

In addition, the SAUQ GI and SAUQ subscales were correlated with GPA to determine if there was a relationship between strategy use and awareness and academic performance. Self-Regulation was the only scale to show a significant relationship (r = 0.27; p < 0.01), indicating increased self-regulation strategy use and awareness are related to increases in GPA. Since GPA is an indicator of average academic achievement in all courses taken, these results suggest that general self-regulation strategies are important across academic domains, whereas strategies such as comprehension monitoring may be critical within specific academic domains.

3.9. Discriminant Validity

In the present study, discriminant validity was assessed in two ways. First, the inter-factor correlations on the SAUQ were reviewed to establish whether factors showed independence from one another. Second, a subgroup analysis was conducted to determine whether students with severe inattention/memory symptoms (i.e., T-score ≥ 60) rated their use of SAUQ strategies differently from students whose inattention/memory symptoms were minimal in comparison to adults their age.

As shown in Table 3.7, inter-factor correlations were weak to moderate. Comprehension Monitoring showed weak correlations with Planning/Organization (r = 0.24, p < 0.05) and Distraction Management (r = 0.20, p < 0.05), and moderate correlations with Self-Regulation (r = 0.43, p < 0.05) and Organization of Materials (r = 0.38, p < 0.05). Planning/Organization showed weak correlations with Self-Reward (r = 0.18, p < 0.05), Organization of Materials (r = 0.27, p < 0.05), and Self-Regulation (r = 0.34, p < 0.05), and a moderate correlation with Organization with Mobile Phone Technology (r = 0.39, p < 0.05). Self-Reward showed a weak correlation with Organization of Materials (r = 0.18, p < 0.05). Self-Regulation showed weak correlations with Organization with Mobile Phone Technology (r = 0.24, p < 0.05) and Distraction Management (r = 0.16, p < 0.05), and a moderate correlation with Organization of

Materials (r = 0.35, $p < 0.05$). Organization with Mobile Phone Technology showed a weak correlation with Organization of Materials (r = 0.24, $p < 0.05$). Distraction Management showed a moderate correlation with Organization of Materials (r = 0.43, $p < 0.05$). As factors appeared to be weakly to moderately correlated, this suggests that factors are partially independent.

Table 3.7. *SAUQ Inter-Factor Correlations*

	CompM	Plan/Org	SReward	SelfReg	OrgTech	DistM	OrgMats
CompM	1.00						
Plan/Org	0.24*	1.00					
SReward	0.07	0.18*	1.00				
SelfReg	0.43*	0.34*	0.08	1.00			
OrgTech	0.11	0.39*	0.03	0.24*	1.00		
DistM	0.20*	0.04	0.05	0.16*	0.12	1.00	
OrgMats	0.38*	0.27*	0.18*	0.35*	0.24*	0.43*	1.00

Note. *Correlation is significant at the 0.05 level. CompM: Comprehension Monitoring; Plan/Org: Planning/Organization; SReward: Self-Reward; SelfReg: Self-Regulation; OrgTech: Organization with Mobile Phone Technology; DistM: Distraction Management; OrgMats: Organization of Materials.

Next, to evaluate discriminant validity between groups, scores on the BRIEF-A GEC, SAUQ GI, and SAUQ subscales were evaluated for group mean differences. The subgroup analysis can be found in Table 3.8. Two groups were created that fell above (n = 49) or below (n = 99) the threshold for subclinical to clinical significance (T-score ≥ 60) on the Inattention/Memory Problems scale according to the CAARS technical manual (Conners et al., 1999). Scales were submitted to multivariate analysis of variance (MANOVA). There was a statistically significant difference between scales based on inattention/memory scores (F (9, 138) = 11.41, $p < 0.01$; Wilk's Λ = 0.57). Between subject effects revealed inattention/memory group differences were statistically detectible on the BRIEF-A GEC (F (1,146) = 97.80, $p < 0.01$), confirming that individuals who report greater levels of inattention and/or memory symptoms in everyday life are also more likely than peers with fewer symptoms to demonstrate behaviours consistent with limitations in EF capacity. Significant group differences were also found on the SAUQ Global Index scale (F (1,146) = 15.65, $p < 0.01$), suggesting individuals with greater levels of inattention and/or memory symptoms are also less likely than peers with fewer symptoms to use strategies to address the negative impacts of behaviours associated with EF capacity limitations.

In addition, the group with severe levels of inattention and/or memory symptoms scored significantly lower than the group with fewer inattention and/or memory symptoms on the following SAUQ scales: Comprehension Monitoring (F (1,146) = 11.78, p < 0.01); Planning/Organization (F (1,146) = 13.63, p < 0.01); Self-Regulation (F (1,146) = 12.01, p < 0.01); and Organization of Materials (F (1,146) = 7.91, p < 0.01). Group differences were not statistically detectible on the following scales: Self-Reward, Organization with Mobile Phone Technology, and Distraction Management. These results show certain domains of the SAUQ are more relevant to the severity of inattention problems than others.

Table 3.8. *Subgroup Analysis*

	Severe Inattention/Memory[1] (n = 49)		**Typical Inattention/Memory[1] (n = 99)**		
	M	**SD**	**M**	**SD**	***F***
BRIEF-A GEC	136.33	20.15	105.66	16.46	97.80*
SAUQ Global Index	106.54	24.04	121.86	21.19	15.65*
SAUQ Comprehension Monitoring	13.06	4.79	15.80	4.45	11.78*
SAUQ Planning/Organization	16.53	5.72	19.82	4.80	13.63*
SAUQ Self-Reward	16.20	5.19	16.83	5.20	0.47
SAUQ Self-Regulation	16.60	4.05	18.84	3.54	12.01*
SAUQ Organization with Mobile Phone Tech.	14.94	6.40	15.86	6.31	0.69
SAUQ Distraction Management	14.23	4.07	15.36	4.43	2.28
SAUQ Organization of Materials	16.53	4.44	18.58	4.02	7.91*

Note: [1] CAARS Inattention/Memory Problems scale; *Correlation is significant at the 0.01 level.

3.10. Summary

In conclusion, a seven-factor model provided the best fit to the data. The seven-factor solution of the SAUQ demonstrated adequate construct validity, and partial concurrent and discriminant validity. Subscales showed acceptable reliability as

indicated by Omega coefficients. However, in terms of concurrent validity, not all SAUQ scales correlated with the BRIEF-A global index or CAARS inattention/memory scale. Subscales measuring Self-Reward, Organization with Mobile Phone Technology, and Distraction Management were not statistically associated with behaviours linked to executive functioning capacity limitations or symptoms of inattention/memory problems. Further, in terms of discriminant validity, not all factors discriminated strategy use and awareness among groups of students with and without severe levels of inattention and/or memory symptoms. Subscales measuring use of Self-Reward, Organization with Mobile Phone Technology, and Distraction Management did not demonstrate a difference in strategy use and awareness between groups. These results will be discussed further in the following Discussion Chapter.

Chapter 4.

Discussion

The goal of the current study was to collect psychometric evidence to develop the SAUQ, a questionnaire measuring strategy use and awareness amongst university students. The SAUQ was developed with the intention to complement pre-existing measures of adult behaviours associated with EF (BRIEF-A) and attention (CAARS). Currently, the field lacks a measure to evaluate compensation strategies applied in contexts where high demands are placed on an executive system such as in a university setting. Overall, 6 to 9 factor models were identified using exploratory factor analysis. Analysis of model fit indices revealed a seven-factor model was most appropriate. The factors represented seven domains of strategy use and awareness: Comprehension Monitoring, Planning/Organization, Self-Reward, Self-Regulation, Organization with Mobile Phone Technology, Distraction Management, and Organization of Materials.

Psychometric analyses revealed this measure had adequate construct validity in that correlations of items with each factor on the final model were moderate to high. However, analyses revealed only partial evidence for concurrent validity. Results showed that students displaying increased levels of EF capacity limitations and attention/memory problems may have difficulty implementing strategies aimed at improving understanding of course readings, planning and organizing various commitments and tasks, self-regulation of course content, and the use of materials to set up study spaces. Strategy use surrounding implementation of self-incentives, mobile phone use for planning and organization, and strategies used to avoid distractions were not shown to relate to levels of EF and attention/memory. Instead, it is possible that these strategies are important for maintaining motivation throughout strenuous tasks.

Additionally, analyses revealed only partial evidence for discriminant validity. Scales addressing self-reward, technological organization, and mitigating distractions also failed to discriminate groups of students who differed in their use and awareness of strategies that previous research has associated with managing control of attention in learning and social contexts. In other words, the subscales Self-Reward, Organization with Mobile Phone Technology, and Distraction Management did not appear to differ

with severity of inattention/memory problems. However, these types of strategies have been shown to be effective as part of a CBT intervention (He & Antshell, 2017). While these strategy domains are not able to discriminate between students with severe levels of inattention/memory problems and those with fewer symptoms, these strategies may be more accessible to students than those more directly associated with managing control of attention and access to an executive system.

Although the aim for most students is to develop agency as learners, implementing strategies directly associated with the EF system may be challenging for them. Complimentary strategies to increase motivation (i.e., self-reward) and/or to prevent challenges from arising (i.e., distraction) may be an effective adjunct to strategies aimed directly at increasing control of attention. As many students in today's world have mobile phones, planning and organization with mobile phones is likely not a good discriminator of organization skills. However, some students may not be aware that they are using their phones optimally to plan and organize, and responses to these items will be helpful both to students and people supporting them.

On the other hand, findings from a meta-analysis by Brown, Smith, Epton, and Armitage (2018) found little research has been conducted to establish the effect self-reward/incentive has on behaviour in adults. The researchers found one reason for this is that self-reward/incentive strategies are usually studied alongside several other techniques included in behaviour change interventions. For this reason, it is difficult to determine which strategies influence behaviour. With the research that is available on self-incentive, Brown et al. found seven studies produced a weak effect size (0.17) for the effect of self-incentive on behaviour change. An important finding from this study was that even when prompted to implement self-incentives, most people do not follow through with implementing a reward system. Therefore, Brown et al. suggest implementation fidelity should be investigated further rather than effectiveness of self-incentivizing alone. More research is needed in this area to determine how self-reward systems can be implemented effectively, how reward in isolation affects behaviour change, and in this case, how reward can affect student strategy use and awareness.

Although students experiencing attentional challenges may be the most in need of strategies to compensate for capacity limitations in an executive system, the analyses of validity suggests students displaying heightened levels of inattention and EF capacity

limitations tend to report lower levels of strategy use and awareness with comprehension monitoring, planning and organization, self-regulation, and organization of materials. This may be because they are not aware of possible strategies that may be helpful, they do not believe the strategies will help, or because they have trouble implementing strategies. As such, students, educators, counsellors, and coaches may find the SAUQ helpful in starting a discussion about how students can develop agency in strategy use. Students can also use information from the SAUQ to gain awareness of their level and diversity of strategy application and knowledge.

This measure is well-suited to compliment diagnostic measures during intervention; however, in itself, it is not a diagnostic measure. The SAUQ was not developed as a diagnostic tool to assess students' behaviours that represent limitations in an EF system, but rather to assess how students adopt strategies to optimize access to an EF system and to compensate for EF capacity limitations due to neurodevelopmental constraints or when environmental demands are high. It is important to note that correlations with the BRIEF-A and CAARS, which are established diagnostic tools, are weak to moderate and only certain scales on the SAUQ are associated with EF behaviours in everyday life.

The SAUQ is unique in that it represents a prosocial approach to improving the academic and social lives of university students. This measure is also unique in its inclusion of a technologically based strategy domain. The SAUQ has potential value for both research purposes and intervention settings. Student self-reported ratings of strategy use and awareness on the SAUQ may be an important addition to future intervention research, especially for interventions targeted at groups experiencing neurodevelopmental disorders, such as ADHD. This measure can be used in studies that inform how university students' awareness and use of compensation strategies impacts academic and social competencies.

Interestingly, the Self-Regulation scale was the only scale that correlated with GPA. This result suggests that self-regulation strategies support academic learning in most courses to some extent. However, other strategies described on the SAUQ may be more important to academic success in some, but not all courses. Therefore, it may be important for students, educators, counsellors, and coaches to discuss together which

SAUQ strategies are the most appropriate for students, based on the courses they are taking.

Taken together, these results provide tentative empirical support for use of the SAUQ in university settings. To further validate the SAUQ, future studies should attempt to confirm the factor structure obtained with other samples. Additional studies should explore further application for students with neurodevelopmental disorders such as ADHD who commonly experience executive functioning capacity limitations. In the current study, a subgroup with self-reported severe levels of inattention was identified; however, as attentional capabilities exist on a continuum, it is entirely possible that this group of students represented a wide range of typical human diversity. Future studies on clinical samples of students with a confirmed ADHD diagnosis is important to further explore the suitability of the SAUQ for use in clinical settings. It may be of interest to develop a version of the SAUQ that is able to address executive functioning capacity limitations in other age groups, as all school aged children at times, experience a need for compensation in an academic environment (Dupaul et al., 2006; Sprich et al., 2006).

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Appendix A.

132 SAUQ Items Submitted for Analysis

1. I prefer to study in quiet places.
2. I put on music as background noise while studying.
3. When I have a paper to write, I write an outline first.
4. I reward myself as I complete parts of an assignment or project.
5. I use a daily planner or calendar.
6. I set a timer to go off at intervals to remind myself to stay on task.
7. I sit at the front of the class.
8. I colour code my study notes.
9. I take notes during class.
10. While doing course readings, I ask myself questions about the main ideas.
11. I break up larger tasks into smaller tasks to help me complete the task.
12. After completing assigned readings, I summarize the main points.
13. I have a tidy place to do my work.
14. I take notes to keep course concepts organized.
15. I use an organizational application(s) on my mobile phone.
16. I keep a list of tasks I need to do throughout the day so that I don't forget.
17. I remove distractions from my environment while studying.
18. I prefer to study in places with background noise.
19. I ask friends for advice when faced with social problems.
20. If I receive a poor grade, I make sure I understand why.
21. While working on the computer, I avoid visiting websites that are irrelevant to my learning for my project or studies.
22. I ask someone to proofread my work before I submit it.
23. I limit my time on social media.
24. If given the option, I would choose to take an online course rather than an on-campus course.
25. I prefer to study in the library.
26. I use a daily planner or calendar to stay organized.
27. I stick to a set homework routine.
28. I handwrite notes as I study.
29. I use a mobile phone application(s) to help me remember things.
30. If given the option, I would choose to take an online course rather than an on-campus course so that I have more free time.
31. I estimate the time it will take to complete a task.
32. While I do course readings, I pick out the main points.
33. I ask for advice when I don't know what to do.
34. If I read a passage and I don't understand it, I reread it right away.
35. I set attainable long-term goals for myself.
36. I contact or go to an instructor's office hours when I need help.
37. I set attainable short-term goals for myself
38. I create places to keep important school materials so that I do not lose them.
39. I use a daily planner or calendar to organize appointments.
40. I type notes on my computer as I study.
41. I study in a quiet place so that I do not get distracted.

42. I reward myself to stay motivated during a task.
43. I keep a list of tasks I need to do throughout the day to stay organized.
44. I read and use constructive feedback given to me on assignments and tests.
45. I limit the amount of time I spend on social media so that I have time to complete my work.
46. I turn off sound notifications from my digital devices while studying.
47. I turn off visual notifications from my digital devices while studying.
48. I stick to a set sleeping schedule.
49. I contact or go to an instructor's office hours when I have missed class.
50. I use a daily planner or calendar to organize deadlines.
51. I use a daily planner or calendar to organize social commitments.
52. I use a filing system to organize important materials.
53. I reward myself after completing a course reading.
54. I limit my use of social media so that I do not get distracted.
55. I use a mobile phone application(s) to keep track of appointments.
56. If given the option, I would choose to take an online course rather than an on-campus course to be more efficient with my time.
57. While working on the computer, I avoid opening applications that are irrelevant to my learning for my project or studies.
58. While reading, I ask myself what the main themes and ideas of the course text are.
59. I ask friends for advice when faced with academic problems.
60. I stick to a routine to complete chores.
61. I use a mobile phone application(s) to keep track of assignment deadlines.
62. I use a mobile phone application(s) to keep track of social commitments.
63. I listen to audio recordings of class lectures.
64. I set attainable deadlines for each section of a task.
65. I use a daily planner or calendar to organize school commitments.
66. I make sure I understand why marks were deducted so that I can do better next time.
67. If given the option, I would choose to take an on-campus course rather than an online course to use the weekly meetings to stay on task.
68. I try to get good at estimating the time it will take to complete a task.
69. I ask questions during conversations.
70. I write down a list of tasks I need to do throughout the day.
71. I ask myself questions while reading a text to ensure I understand the main concepts.
72. I try to learn new study strategies from others.
73. I ask friends for advice when faced with problems at work.
74. I colour code my study notes to highlight themes or important information.
75. If given the option, I would choose to take an on-campus course rather than an online course so that I can ask for help in person.
76. I choose the least distracting place to sit in class.
77. I ask people to repeat themselves if I am unsure about the meaning of what they said.
78. I handwrite notes as I study to organize ideas and concepts.
79. I turn off notifications from my digital devices while studying to make sure I stay on task.
80. I ask a member(s) of my family for advice when faced with social problems.
81. I stick to a set sleeping schedule to make sure I have enough energy for the day.

82. I ask questions during conversations to ensure I understand the perspective of others.
83. I use a mobile phone application(s) to keep track of school commitments.
84. I limit the number of social media applications that I use.
85. I use a daily planner or calendar to organize work commitments.
86. I am conscious of my body language as I talk to others.
87. I study in a place with background noise so that the silence does not distract me.
88. I break up a large task into smaller parts.
89. I keep a mental list of tasks I need to do throughout the day.
90. I link the calendar on my phone to my other digital devices.
91. I ask a member(s) of my family for advice when faced with academic problems.
92. I put my mobile phone away while studying to make sure I stay on task.
93. I try to stay focused on a conversation by asking questions.
94. When I disagree with someone, I try to understand their perspective.
95. I avoid studying in my bedroom.
96. I type notes as I study to organize ideas and concepts.
97. I ask a member(s) of my family for advice when faced with problems at work.
98. I turn off my mobile phone while studying.
99. I use a mobile phone application(s) to keep track of work commitments.
100. I limit my time on social media to less than 30 minutes per day.
101. I put on the TV as background noise while studying.
102. I try to understand how others are feeling when I disagree with them.
103. I try to control my body language when talking to others.
104. I work in a tidy area so that I can think clearly.
105. I set up a reward system to stay focused during a task.
106. I prefer to study in coffee shops.
107. I make sure I face whomever is speaking.
108. When frustrated, I pause before I react.
109. I try to find new ways to focus my attention while studying.
110. I divide tasks into smaller parts so that I can keep track of what needs to get done.
111. As I study, I write down questions to ask if there are points I don't understand.
112. I use constructive feedback to improve the quality of my work.
113. I try to find new ways to focus my attention.
114. I pause before reacting when I am upset so that I can process my emotions.
115. I remove distractions from my environment.
116. I type notes during class.
117. Before reacting, I stop to take a deep breath.
118. I handwrite notes during class.
119. I set up my study space so that I have everything I need to stay focused.
120. If a study strategy does not work, I change it.
121. When emotionally upset, I calm myself by going for a walk.
122. I try to control my body language in social situations because I am aware of how this can affect others.
123. I take notes to stay focused on the class lecture.
124. I limit my time on social media to less than one hour per day.
125. I keep my work place tidy to stay organized.
126. I try to find new ways to focus my attention in social situations.
127. When emotionally upset, I calm myself by exercising.
128. I take time to set up my study space.
129. After completing a term assignment or project, I reward myself.

130. I leave the house to study so that I do not get distracted.
131. When emotionally upset, I try to distract myself from the source of stress.
132. I keep my arms uncrossed when talking to others.

Appendix B.

Demographic Questionnaire

1) Year and month of birth: __/__/__/__- __/__

2) Gender: _____

3) Country of birth: _____

4) How long have you lived in Canada? ____ years

5) Residence status: ☐ Student Visa ☐ Permanent Residence

   ☐ Canadian Citizenship ☐ Other: _____

6) What type of student are you? ☐ Domestic ☐ International

7) Total years of education (from K): _____

8) Current level of education:

   ☐ Less than high school ☐ High school ☐ Undergraduate level certificate

   ☐ Undergraduate level diploma ☐ Bachelors degree ☐ Post graduate level certificate

   ☐ Post graduate level diploma ☐ Master's degree ☐ Doctorate ☐ Professional

   certificate program ☐ Other: _____

9) What is your Cumulative GPA (for each degree if multiple)? _____

10) What is your major(s)? _____

11) What is your ethnicity? Please check all that apply.

   ☐ European Canadian ☐ Chinese ☐ South Asian ☐ Filipino ☐ Southeast Asian

   ☐ Japanese ☐ Latin American ☐ Other: _____

12) What is your language of cultural origin? _____

13) I am fluent in spoken English (please check one).

   ☐ Strongly disagree ☐ Disagree ☐ Somewhat agree ☐ Agree ☐ Strongly agree

14) In addition to English, what other languages do you speak fluently? Please check all that apply.

☐ French ☐ Punjabi ☐ Cantonese ☐ Chinese ☐ Mandarin ☐ None

☐ Other: _____

15) In your everyday life, how often do you speak English?

☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

16) Have you attended school where the language of instruction was different than English?

☐ Yes ☐ No

17) If yes, which language?

☐ French ☐ Punjabi ☐ Cantonese ☐ Chinese ☐ Mandarin ☐ None

☐ Other: _____ ☐ N/A

18) Have you ever been diagnosed with any of the following disorders? Please check all that apply.

☐ Neurological disorder

☐ Generalized anxiety disorder

☐ Depression

☐ Mood disorder

☐ Substance use disorder

☐ Other: _____

☐ N/A

19) Have you ever been diagnosed with ADHD by a physician?

☐ Yes ☐ No

20) Have you ever been prescribed medication by a physician for ADHD or to reduce ADHD symptoms?

☐ Yes ☐ No

Appendix C.

Final 35 SAUQ Items

1. While doing course readings, I ask myself questions about the main ideas.
2. After completing assigned readings, I summarize the main points.
3. While I do course readings, I pick out the main points.
4. While reading, I ask myself what the main themes and ideas of the course text are.
5. I ask myself questions while reading a text to ensure I understand the main concepts.
6. I use a daily planner or calendar to organize appointments.
7. I use a daily planner or calendar to organize social commitments.
8. I use a daily planner or calendar to organize school commitments.
9. I write down a list of tasks I need to do throughout the day.
10. I use a daily planner or calendar to organize work commitments.
11. I reward myself as I complete parts of an assignment or project.
12. I reward myself to stay motivated during a task.
13. I reward myself after completing a course reading.
14. I set up a reward system to stay focused during a task.
15. After completing a term assignment or project, I reward myself.
16. If I receive a poor grade, I make sure I understand why.
17. I ask for advice when I don't know what to do.
18. I contact or go to an instructor's office hours when I need help.
19. I read and use constructive feedback given to me on assignments and tests.
20. I make sure I understand why marks were deducted so that I can do better next time.
21. I use a mobile phone application(s) to keep track of appointments.
22. I use a mobile phone application(s) to keep track of assignment deadlines.
23. I use a mobile phone application(s) to keep track of social commitments.
24. I use a mobile phone application(s) to keep track of school commitments.
25. I use a mobile phone application(s) to keep track of work commitments.
26. While working on the computer, I avoid visiting websites that are irrelevant to my learning for my project or studies.
27. I turn off sound notifications from my digital devices while studying.
28. I turn off visual notifications from my digital devices while studying.
29. I limit the number of social media applications that I use.
30. I put my mobile phone away while studying to make sure I stay on task.
31. I have a tidy place to do my work.
32. I work in a tidy area so that I can think clearly.
33. I set up my study space so that I have everything I need to stay focused.
34. I keep my work place tidy to stay organized.
35. I take time to set up my study space.