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The Effects of Goal Management Training in Undergraduate Students with Problems in
Attention Functioning

by

Jenny Carstens

A Thesis
Submitted to the Faculty of Graduate Studies
through Psychology
in Partial Fulfillment of the Requirements for
the Degree of Master of Arts at the
University of Windsor

Windsor, Ontario, Canada

2011

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The Effects of Goal Management Training in Undergraduate Students with Problems in
Attention Functioning

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September 6, 2011

DECLARATION OF ORIGINALITY

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ABSTRACT

Most research on training of executive functions involves older adults or individuals with brain injury. The present study was conducted with 122 undergraduates who reported some difficulties with attention and executive functions. Students either received a forty-five minute session of Goal Management Training (GMT) or performed a distraction task. Tasks requiring goal management (GM) skills were given before and after this session. There was a significant decrease in completion time of the tasks overall ($p < .05$), as well as a significantly greater decrease in the experimental group ($p < .05$). There was a non-significant decrease in errors across both groups with no significant group difference in change. In addition to demonstrating a robust practice effect on GM tasks, the results suggest that brief GMT may be helpful to undergraduates who experience attentional difficulties. Further work is needed to understand the value and essential components of GMT in this population.

DEDICATION

To Mum and Dad. Thank you for your unconditional support and love throughout my life, which gave me the chance to find my own way and improve myself academically and as a person. I love you very much.

ACKNOWLEDGEMENTS

I would like to thank my supervisor, Dr. Anne Baird, for her support throughout this project. Her feedback, guidance, and patience were greatly appreciated. Further, I thank my committee members Dr. Joseph Casey and Dr. Lorna de Witt who have made an otherwise stressful experience much less so through their kindness, while providing constructive criticism.

I also thank my fellow graduate students in my lab who allowed me to test my materials on them, provided thoughtful suggestions, and supported me emotionally as well. On a more personal note, I would like to thank my family. Without their support, I would not have been able to pursue and finish my Master's degree. Finally, I thank my roommate Ashley for always being there for me and calming me down on those occasions where I felt as if I was losing my mind.

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CHAPTER I

INTRODUCTION

Undergraduate students often report some degree of problems while focusing their attention, getting distracted, or working towards a desired goal. The degree of these problems varies and is oftentimes not severe enough to require them to seek professional help. Cognitive interventions that exist are not targeted for this population, but rather focus on people who have more severe impairments. This study was conducted in order to develop a program that will be helpful for the more general undergraduate population with a lesser degree of attentional problems than those who have been diagnosed with an attentional disorder.

Before describing the current research study in more detail, the relevant literature will be reviewed. More specifically, the review will include a description of executive functions (EFs) and concerns that are associated with the term itself, as well as research involving these functions. As attention is a fundamental part of executive functioning, there will be a more thorough review of this feature. That is, disorders that involve attention, as well as the relation between attention and executive functioning will be discussed in more detail. Research on different approaches to interventions that focus on executive functions will be reviewed. This is followed by a discussion of goal management training, specifically an exploration of its development and previous applications. Finally, the present research will be introduced and described, including the rationale, method, results, and a discussion of the findings.

CHAPTER II

REVIEW OF LITERATURE

Executive Functioning

It is generally agreed upon that the brain develops hierarchically, with “lower” cognitive functions developing earlier than “higher” cognitive functions, which develop later in life. More specifically, Stuss (1992) reported that several studies of the brain’s metabolic activity, electroencephalography measures, and neural myelination support this view. Puberty typically marks the maturation of the prefrontal structures of the brain, but subsequent development continues to occur until one’s middle age (Alvarez & Emory, 2006; Dennis & Cabeza, 2008).

Although it is difficult to define executive functions (EFs), they are generally considered to be “higher-level” functions that organize and control goal-oriented thoughts and behaviours. They are especially important in tasks that are new or challenging and those that are important to success in everyday life. Examples of EFs include attention, reasoning, working memory, the ability to inhibit initial responses, planning, decision-making, monitoring of ongoing tasks, and shifting between tasks (Alvarez & Emory, 2006; Biederman et al., 2004). Inhibition, working memory, and planning or strategic processing specifically have been identified as the three main components of EFs (Connor & Maeir, 2011). EFs are essential for planning and management of daily activities (for example, taking medication, going grocery shopping, and so forth).

Miyake et al. (2000) examined three components of executive functioning (namely, shifting one’s mental set, updating and monitoring information, and inhibiting one’s responses) and found that these components were moderately correlated with each

other. Furthermore, it was found that different tests of EFs tap each of these components to a different degree. For example, successful performance on the Wisconsin Card Sorting Test was most strongly related to mental set shifting, whereas successful performance on the Tower of Hanoi task was most strongly related to response inhibition. These findings illustrate the complexity of EFs.

Executive Functioning and Attention

Attention-deficit/hyperactivity disorder (ADHD) is often associated with deficits in EFs. ADHD is defined in the *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision* (DSM-IV-TR; American Psychiatric Association [APA], 2000) as a disorder with attention, impulsivity and hyperactivity, or a combination of these as the key symptoms. The symptoms of inattention can include, for example, the failure to pay attention to details, difficulty sustaining attention, or difficulties organizing tasks and activities. The symptoms of hyperactivity, on the other hand, can include fidgeting with one's hands, leaving one's seat in the classroom, or talking excessively. These symptoms must be present for at least six months and must be maladaptive and cause impairment in either social, academic, or occupational functioning. In addition, some of these impairments must have been present before the age of seven, and the symptoms must be present in more than two settings (for example, at school, at home, and so forth). Finally, the symptoms must not be better accounted for by another mental disorder, such as Anxiety Disorder or Personality Disorder.

Willcutt et al. (2005) conducted a meta-analysis of 83 studies that looked at EFs in groups with and without ADHD and found that groups with ADHD exhibited more EF deficits, although these differences were often only small in magnitude. Brown, Reichel,

and Quinlan (2009) found that 73% of adults with ADHD who have an IQ higher than 120 show an impairment in five or more out of eight EF measures.

Studies have shown that children with ADHD often experience problems in their academic functioning (for example, Biederman, Faraone, Milberger, & Guite, 1996). Biederman et al. (2004) investigated whether these difficulties stem from ADHD alone, or whether EF deficits play a separate role. They compared, among other things, the academic impairments in children with ADHD and EF deficits, children with ADHD without EF deficits, and children in a control group. EF deficits were defined as impairment in at least two out of eight measures of executive functioning. After controlling for the participants' medication status and clinical symptoms of ADHD, as well as IQ, socioeconomic status, and learning disorders, their results confirmed the notion that EF deficits are more prevalent in children with ADHD than in a control group. It was also shown that children with both ADHD and EF deficits were at greater risk for grade retention, learning disorders, and lower academic achievement than children with ADHD alone or the control group. This suggests that EF deficits contributed to the participants' academic difficulties over and beyond the difficulty attributable directly to ADHD.

While this body of research demonstrates how a certain population of children and younger adults may experience EF deficits, research at the other end of the age spectrum has also shown that EFs may be affected by the cognitive decline that occurs with aging or because of damages to the brain due to various diseases, such as strokes and tumors (Stuss, 1992; Stuss & Levine, 2002). The most prominent structures underlying EFs are the frontal lobes, which not only develop comparatively late in life,

relative to other brain areas, but are also thought to show some early degeneration due to the normal aging process (Raz, 2000). Normal aging is associated with a decline in a variety of cognitive functions, such as attention, verbal fluency, mental imagery, and memory (Hofer & Alwin, 2008). Some theories have been suggested as to what underlying mechanisms are responsible for this. Among these are, for example, general declines in sensory functions, speed of processing, or inhibitory control. It is generally agreed upon that no single mechanism is responsible for the cognitive decline, but rather that several are a factor in the cognitive aging process (Birren & Schaie, 2006). Although a decline in these functions is the norm, it is important to keep in mind that there are considerable individual differences in terms of the severity (Birren & Schaie, 2006; Hofer & Alwin, 2008).

Interventions for Executive Functions

Over the past decades, more studies have been published that focus on EF deficits and possible intervention strategies. In general, there are four different approaches to improving EFs, namely re-training EFs, using internal or external strategies to counterbalance the deficits, encouraging modifications in the environment (for example, working with friends and co-workers), and implementing drug treatments (Miotto, Evans, Souza de Lucia, & Scaff, 2009). However, there is still a great need for empirical studies that investigate EFs and potential interventions.

Von Cramon, Matthes-von Cramon, and Mai (1991) developed a problem-solving therapy (PST) to help individuals with brain injuries. Thirty-seven participants with brain injuries were divided into a PST group and a memory training (MT) group as the control group. The participants received pre- and post-evaluations on several measures,

including a general intelligence test, the Tower of Hanoi test, a planning test, and a problem-solving rating. The PST consisted of exercises that focused on different problem-solving processes, such as breaking the problem down into smaller problems, and using a controlled and stepwise approach to solving them, instead of an impulsive one. Although the PST group performed better on problem-solving tasks compared to the control group, no generalizations of these improvements were observed in the participants' everyday functioning.

Manly, Hawkins, Evans, Woldt, and Robertson (2002) conducted a study with ten participants who suffered from brain injury and who had difficulties with their EFs. They presented the participants with five tasks that typically take over 60 minutes to finish, but told them to attempt to do some of each of these tasks within a 15 minute time limit. Participants with brain injuries initially performed significantly worse than a matched control group (participants were matched on age and IQ), thus not succeeding in monitoring their time or intentions, or switching between the tasks. However, once auditory cues were periodically presented, the brain injured participants improved to the extent that the difference between them and the control group was no longer significant. The authors concluded that the initial difficulties of the brain injured participants were attributable to their neglect of goals, rather than memory difficulties or lack of task comprehension.

In an attempt to improve EF deficits in cognitively impaired individuals and to address the lack of cognitive rehabilitation programs that emphasize EFs, Levine et al. (2000) focused their approach (goal management training, GMT) on the theory of *goal neglect* by Duncan (1986). Goal neglect occurs in real life situations, rather than being

an example of memory deficits that may be present in simulated situations (that is, in laboratory experiments), such as remembering word lists. According to Levine et al. (2000), goal management, or “maintaining intentions in goal-directed behavior” (p. 299), is an EF, as it relies on higher-level functions. The findings of Manly et al. (2002) in a brain-injured sample known to have executive dysfunction also provide support for the argument that goal management is an EF. Specifically, Manly’s participants experienced an improvement in goal management tasks when provided with cues to assist in monitoring task performance, even though they received no assistance in meeting the memory and other cognitive demands of the task.

Goals in general are thought to “impose a structure on behavior by controlling the activation or inhibition of behavior that facilitate or prevent task completion” (Chan, Shum, Touloupoulou, & Chen, 2008, p. 206). Duncan, Emslie, Williams, Johnson, and Freer (1996) state that in order to do a task successfully, one needs a list of goals and their relevant requirements, which in turn impose a structure on one’s thoughts and actions. In successful goal management, while performing a certain action, one’s current state is repeatedly being compared with the desired state and, in case of a discrepancy between the two, a more suitable course of action or cognitive strategy is selected until there is no more such discrepancy. Another important purpose of the goal list is to ensure consistency in one’s behaviour by inhibiting actions that do not contribute to the goal state. That is, any behaviour that is distracting and irrelevant to the goal is restrained through this process. According to Duncan (1986), patients whose frontal lobe functions are impaired show disorganized behaviour as a result of the diminished ability to develop and follow goal lists. Most research related to attention and its effects on goals, or goal-

relevant behaviour, has focused on having a single goal. As mentioned before, having one goal directs a person's attention toward environmental stimuli, cognitive processes, and behaviour that will facilitate reaching the goal. In real life, however, individuals often have multiple goals that are either incompatible or require competing attentional resources. In these situations, individuals need to prioritize their goals (Vogt, Houwer, & Crombez, 2011). Vogt et al. (2011) found that prioritizing goals, based on either their value or the participants' expectancy of success, directed participants' spatial attention. They used a dot-probe paradigm, which involves showing two words simultaneously at different locations on the screen that are immediately followed by a probe. Participants' reactions were faster to probes that appeared at the location of a prioritized word category.

GMT is one specific approach that focuses on the rehabilitation of EFs by teaching participants to organize their behaviour. According to Levine et al. (2000), GMT addresses several aspects of goal management, such as “attention, problem definition, problem-solving, encoding and retrieval strategies, and monitoring” (p. 310). Initially developed by Robertson (1996, as cited by Levine et al., 2000), Levine et al. (2000) adopted and slightly modified the GMT, which now consists of five stages (see Table 1).

Table 1

The Five Stages of GMT

1. STOP!	Orienting and alerting to task
2. Define main task	Goal setting
3. List steps	Partitioning goals into sub-goals
4. Learn steps	Encoding and retention of sub-goals
5. Check	Monitoring

Note: Robertson, 1996, as cited in Levine et al. (2000, p. 302)

Each of these stages is an integral part of successful goal management. In the first stage, individuals orient themselves and become aware of their present state. The current activity of the individual needs to be suspended and his or her attention directed towards assessing the existing situation and the intended goal. Oftentimes, participants use a catchphrase that assists them in this task. Then, in stage two, they set appropriate goals for themselves. In stage three, their set goals are divided into subgoals, which is especially important when the goal itself is very complex. They learn the subgoals through encoding and retention in stage four to make sure they know them well before they act. In the final stage, they need to check if the outcome of their chosen action matches the intended goal state. If this is not the case, they return to stage one again and repeat the subsequent stages (Levine et al., 2000).

Attentional control is an important component of GMT. According to Diehl, Semegon, and Schwarzer (2006), *attention control* is defined as “a person’s ability to

focus his or her attention on a given task, to control and regulate external and internal distractions, and to work toward a desired goal or outcome” (p. 306). Further, Luszczynska et al. (2004) describe the relation between attention and the pursuit of one’s goals through the common factor of self-regulation. Namely, “self-regulation processes are based on feedback loops . . . that can be enhanced by means of attention. All self-regulatory processes involve attention Attentional selectivity facilitates the processing of goal-supporting information and inhibits processing of information related to competing aims” (p. 556). Thus, attentional control does not only include attention itself, but also related aspects such as, for example, self-regulation and goal completion.

Although training in attentional control plays an important role throughout GMT, there are certain stages in which it appears to be even more critical than in others. GMT may be especially relevant to attentional control in the first stage (that is, “Stop,” orienting and alerting to task) as it may assist the participants to remember their catchphrase, task, or goal, and thus it may assist in the initiation of the goal-setting strategies. Practicing stage four (that is “Learn steps”, encoding and retention of subgoals), may also be beneficial in maintaining attention. Additionally, stage five (“Check,” monitoring) utilizes one’s skill to maintain attention. That is, once an action has been finished it is necessary to compare the outcome to the desired goal state and forgetting to pay attention may result in forgetting this comparison, and thus the goal will not be reached. Monitoring and checking this assumption is a vital step on the path to reaching the intended goal, and paying attention to the monitoring of the goal, the main task, and the subtasks is necessary for success. As a result, there are several aspects of

GMT that focus on attention. Through practice, participants may increase the utilization of goal setting strategies, which will, in turn, increase their overall effectiveness.

Levine et al. (2000) used the GMT approach with 30 patients who suffered from traumatic brain injury (study one), as well as with one post-encephalitic patient (study two). Results of their first study indicated that GMT improved the patients' executive functions, as measured by everyday paper-and-pencil tasks that represented these functions. Although participants' performances on these tasks were slower than before the intervention, they included fewer errors after the intervention. It was suggested that the training program triggered the participants to act more carefully and to become more aware of their tasks. As Levine et al. (2000) pointed out, their previous clinical experience indicated that to simply instruct participants to slow down and be more cautious when doing a task is not an effective strategy to improve performance, which demonstrates the value of GMT.

The second study by Levine et al. (2000) also showed positive results. In this case study, the emphasis of the GMT was on enabling the patient to prepare her own meals. Here, the individual practiced GMT with paper-and-pencil tasks, but once she had mastered these tasks successfully, the goal-management skills were transferred to that specific real-life situation (that is, meal preparation).

There have been several studies that are based on this approach. Stuss et al. (2007), Craik et al. (2007), Levine et al. (2007), Winocur, Palmer et al. (2007), and Winocur, Craik et al. (2007) all reported different aspects of one experimental trial that was conducted with 49 healthy older adults (between 71 and 87 years of age) reporting cognitive difficulties consistent with normal aging. A modified version of the GMT by

Levine et al. (2000) was used, in which the GMT time was lengthened to four weekly meetings of three hours, instead of one one-hour session, and the effects of GMT on real-life situations were emphasized. Memory skills training and psychosocial training were the foci of two other added four-week modules. The participants were assigned to an Early Training Group, in which they received the training directly after pre-assessments, or to a Late Training Group, in which the training took place three months after the pre-assessments.

One of the assumptions regarding this study was that older adults, in general, tend to underutilize their organizing and planning abilities and thus they may benefit from help in the acquisition and implementation of certain strategies. The aim of their approach was to rehabilitate cognitive functions, but especially to improve the participants' strategic functioning (Stuss et al., 2007).

Levine et al. (2007) focused on the GMT intervention. The purpose of the GMT method was to facilitate the organization of complex tasks into subtasks so that the participants became more capable in their execution, and thus were more successful. They focused particularly on the real-life difficulties in EFs that arise due to the aging process. More specifically, they mentioned problem-solving, disorganization, and forgetting things as examples of such. In the approach of Levine et al. (2007), participants were trained to consciously think about the problem at hand and the goal that is sought before they implemented the task, as well as keeping the problem and goal in mind throughout execution. Additionally, participants were trained in defining the task, splitting a complex task up into sub-tasks, and in monitoring their execution. The approach of Levine et al. (2007) was very interactive. Participants completed in-session

exercises and homework assignments throughout the four weeks of GMT. They also had one-on-one meetings with the group leader to establish individual goals and address individual difficulties encountered throughout the program.

Levine et al. (2007) measured the success of their rehabilitation program with simulated real-life tasks (SRLTs) in which the assessment was based on raters' observation of target behaviours. These SRLTs were paper-and-pencil tasks designed to represent everyday activities that demand executive functioning and are thus difficult for individuals with executive functioning deficits. Each consisted of one main goal and several subgoals. An example of one such task is setting up a carpool schedule to drive to school. Additionally, a self-report measure of strategic difficulties was included as an assessment measure. It was shown that this rehabilitation training was successful in improving the participants' EFs. These benefits were maintained at a long-term follow-up after six months.

Van Hooren et al. (2007) examined the effects of a different rehabilitation program with the focus on EFs in older adults. Their program consisted of 12 sessions (two per week) and was based on the GMT of Levine et al. (2000), but also included a psycho-educational component. Sixty-nine participants were randomly assigned to an experimental or a control group. It was found that participants who received the intervention improved their structuring abilities. More specifically, they were better able to plan activities and to follow this plan, they increased their time-estimation skills, and they showed less distractibility than participants in the control group. Furthermore, subjective measures also showed a positive effect in that participants reported less annoyance with previously reported executive problems. Van Hooren et al. (2007)

concluded that their intervention is most suitable for individuals who are intellectually capable of processing the information that is provided in the program but who have executive problems.

Miotto et al. (2009) used an attention and problem-solving (APS) treatment to improve EFs in individuals with frontal lobe injury. Their approach resembles a combination of GMT and PST. It consisted of a ten week program where participants were required to attend once a week for a 90 minutes session. Thirty participants were separated into three groups: one group received the APS treatment, one received “treatment as usual”, and the last underwent an educational/informational training. The two groups that initially did not receive the APS did so at a later point in time.

Attention was the focus of the first four weeks of the intervention (including an educational component, as well as strategies that participants may use to manage their attention) and problem-solving of the last six weeks. During this time, they were also introduced to the goal management strategies of the GMT. The aim of this strategy was to teach the participants to take a systematic approach to problems they encountered in their lives, and thus to inhibit impulsive responses. More specifically, their training included teaching them to be aware, to monitor, and to evaluate problems. Furthermore, their intervention taught the participants to develop and plan, as well as to initiate and implement that plan. Lastly, participants were trained to monitor and evaluate their progress. Initially their practice involved theoretical problems, which were later on replaced by real-life problems from participants’ own experiences. The measures of executive functioning used by Miotto et al. (2009) included the Wisconsin Card Sorting Test, Modified Multiple Errand Task (MMET), Dysexecutive Syndrome Questionnaire

(DEX), Verbal Fluency (FAS), and the Virtual Planning Test. Results only partially supported the effectiveness of APS. That is, there was an improvement in the performance on the executive functioning measures across groups, but the APS group improved significantly more on only the MMET and DEX.

The U.S. Department of Veterans Affairs (U.S. National Institute of Health, 2011) is currently conducting a study that is also using a version of GMT with veterans with mild traumatic brain injury. Their GMT consists of seven two-hour sessions in which the participants are presented with the five steps of goal management. The steps are practiced during several paper-and-pencil tasks within the group environment, as well as individually at home. Their family members are being incorporated through involvement in homework assignments and feedback about the participants' experiences and progress. Results have not been published yet, as the proposed completion date of the study is December 2011.

The previous findings of the effects of GMT support the view that it potentially provides a new avenue to improve achievement and efficiency in undergraduate students with attentional difficulties. This is likely to be a sizeable group of students for whom improved executive function could boost both emotional well-being and academic performance.

While there is no study that has investigated the number of university students who experience inattention but do not meet criteria for ADHD, it is probable that there is a high number of such students. ADHD affects approximately 3 to 7% of school-aged children (APA, 2000), and persists into adulthood in approximately 35 to 70% of those individuals (Weisler & Goodman, 2008). ADHD in academic settings appears to be

fairly common with estimates ranging from 4% (as in Weyandt, Linterman, & Rice, 1995) to 11% (as in Heilingenstein, Conyers, Berns, & Smith, 1998), depending on the criteria used. Thus, it is assumed that the number of students with problems in attention not severe enough for an ADHD diagnosis is even higher than this.

In a study by Rabiner et al. (2008), college students with ADHD showed more depressive symptoms and academic concerns than a control group. According to them, inattentive symptoms served as an explanation for these findings. Even after controlling for personality traits (that is the *Big Five* personality traits: agreeableness, extraversion, conscientiousness, emotional stability, and openness to experiences), inattention continued to be a significant contributor to academic concerns and depressive symptoms. Hyperactive-impulsive symptoms, on the other hand, were not related to these outcomes. Because EF deficits occur at a higher rate in individuals with ADHD and because attention is considered to be an important component in EFs, the assumption can be made that deficits in attention alone (without hyperactivity) contribute to EF deficits. This further demonstrates the potential value of GMT for students with attention difficulties.

Other aspects of GMT, specifically the motivational value, also may be helpful to undergraduate students who report problems with attention. A study by Morisano et al. (2010) reported that approximately 25% of university students in a four year program never graduate and the majority of students who do graduate take longer than expected. There are several reasons associated with this, including motivation, a lack of clear goals, and poor academic progress. Morisano et al. (2010) investigated whether an online goal-setting program would be beneficial for undergraduate students and found that participants reported a higher GPA, a higher likelihood to maintain a full course load, and

lower negative affect than a control group. Goal-setting has previously been reported to increase an individual's level of performance. The reason for this is that goals are thought to be strong motivators for people, especially ones that are specific, proximal, and challenging. Such goals are associated with a higher level of task completion (Locke & Latham, 2006). It is therefore likely that GMT will equip the students with new skills to successfully set goals and reach them, and thus to succeed in their academic careers.

There are many students struggling in and adjusting to the academic setting and it is therefore important to find ways to support them in their endeavor. Because undergraduate students are assumed to have the necessary intellectual capabilities to process the information of the intervention, it is easy to see that the conclusion of van Hooren et al. (2007) that GMT is suitable for such populations applies here, especially if problems with study skills and self-regulation are reported.

The Present Study

As of yet, there have been no systematic investigations of cognitive intervention programs with younger adults that focus on GMT. Thus, this study will examine the effects of the GMT protocol of Levine et al. (2000), originally used with cognitively impaired patients, on undergraduate students who report difficulties in attention, timely task completion, and self-regulation.

In addition to testing a new intervention for undergraduate students, who were young adults mostly, this study may serve as the basis for a future study that will involve older, cognitively healthy adults. It assessed the measures used and test-retest practice effects, as well as the effectiveness of the intervention.

Hypothesis 1

Since the current literature shows that GMT has been effective in improving performance on tasks that are related to goal management and executive functioning, it was hypothesized that here as well GMT would improve participants' performance on goal management tasks relative to a comparison group who had not received such training. This increase was measured in terms of the number of errors made on the GM assessment tasks, as well as on completion time.

Hypothesis 2

As attention is one component of EFs, and because GM measures were developed to assess these functions, it was hypothesized that there would be a negative correlation between the participants' severity of attentional problems and their performance on the first GM measures (the pre-training assessment).

CHAPTER III

DESIGN AND METHODOLOGY

Participants

The participants in this study were undergraduate students attending a psychology course at the University of Windsor. They were recruited through the Participant Pool website of this University. Students were asked to sign up for this study only if they had never been diagnosed with a learning disorder. Furthermore, they were asked only to participate if they had problems focusing their attention on a given task, controlling and regulating distractions, or working toward a desired goal (see Appendix A). The Background Questionnaire served as a verification measure that both of these requirements were met. One hundred and forty-one students participated in this study.

At the beginning of the study, the students were asked to give written informed consent. The participation in this study was voluntary but participants were given an incentive of two bonus points to be used for a psychology course of their choice. This study received approval by the University's Research Ethics Board.

Procedure and Design

This study had within- and between-subjects components. The assessments and intervention occurred during one session that took approximately one and a half hours. Participants were tested in groups of no more than four to enable the researcher to keep track of their response times. The specific order in which measures were administered for the experimental and control groups can be seen in Table 2.

Experimental group. At the beginning of the session, the participants in the experimental group (that is, those who received GMT) were tested on pre-assessment

measures of GM and attention. The GM measures included a proofreading task (Appendix B), a grouping task (Appendix C), and a room layout task (Appendix D). Furthermore, the attention measure consisted of the Robert Morris Attention Scale (RMAS; Appendix E). In addition, they filled out the Behavioral Rating Inventory of Executive Functions for Adults (BRIEF-A) and the Background Questionnaire (Appendix F) to assess the level of their EF difficulties. Participants then underwent the GMT (see Appendix G and H), after which they were tested on post-assessment measures of GM. This assessment consisted of the same tasks as the pre-assessment measures described above, but for the GM post-measures a different version was presented (see Appendix B, C, and D). In addition, the participants were asked to fill out the Feedback Questionnaire (Appendix I) that was designed to assess the overall quality of the training and assessment procedure. This information will be useful in further development of the intervention for undergraduate students and future interventions for cognitively healthy, older adults.

Control group. The control group completed the same pre-assessment measures of GM and attention as the experimental group, as well as the BRIEF-A, the RMAS, and the Background Questionnaire. This was followed by a distractor task, which required the participants to view several pictures, to fill out the Dissociative Experiences Scale (DES), and to complete a picture recognition task (Appendix J). In addition, they engaged in a word recall and recognition task (Appendix K and L). After this, they completed the post-assessment measures of GM (as described above).

Table 2

Procedure of the Study for the Experimental and Control Group

Experimental Group	Control Group
<ul style="list-style-type: none"> • Pre-assessment of GM <ul style="list-style-type: none"> ○ Proofreading, Grouping, and Room Layout task • Assessment of attention functioning <ul style="list-style-type: none"> ○ RMAS • BRIEF-A • Background Questionnaire • GMT • Post-assessment of GM <ul style="list-style-type: none"> ○ Proofreading, Grouping, and Room Layout task (different version) • Feedback Questionnaire 	<ul style="list-style-type: none"> • Pre-assessment of GM <ul style="list-style-type: none"> ○ Proofreading, Grouping, and Room Layout task • Assessment of attention functioning <ul style="list-style-type: none"> ○ RMAS • BRIEF-A • Background Questionnaire • Distractor task <ul style="list-style-type: none"> ○ Picture observation task, DES, Picture recognition task, Word recall task, and Word Recognition task. • Post-assessment of GM <ul style="list-style-type: none"> ○ Proofreading, Grouping, and Room Layout task (different version)

At the end of the study, both groups were debriefed. At that time they were advised that they were randomly assigned to one of the two groups. Each participant in the control group was then given the option of signing up for a future GMT session.

Materials

Both groups. Experimental and control groups completed the same measures of GM skills at the beginning and end of the study. They also completed other indices of attention and executive problems as well as a background questionnaire.

Goal-management skills assessment. The participants' GM skills were assessed two times in total. The assessment instruments for this were based on the everyday paper-and-pencil tasks developed by Levine et al. (2000), but the difficulty level in the present version was greater. More specifically, the proofreading and grouping tasks contained additional criteria that the participants had to keep in mind and they were instructed to complete the tasks as quickly as possible. The assessment was designed to measure the GMT effects and took approximately 15 minutes to administer. It consisted of three tasks (that is, proofreading, grouping, and room layout) that required the retention of goals, analysis of subgoals, and monitoring of one's performance. In order to counterbalance any possible order-effects of the two versions of these three tasks (version A and version B), they were switched halfway through the data collection process so that one half of the participants received version A of the instruments followed by version B, and the other half of the participants received version B of the instruments followed by version A.

Proofreading. Participants were asked to proofread a short paragraph following four instructions (words of a certain category had to be underlined, crossed out, circled,

or boxed). They had one minute to study the instructions after which they were removed from sight. The assessment entailed the number of errors they committed (omission and commission errors), as well as completion time (see Appendix B)

Grouping. Here, the participants were given a piece of paper that showed two columns, each with the gender (“F” for female and “M” for male) and age (for example, “29 F”) for 23 hypothetical individuals. They were given instructions that were removed from sight after one minute. These instructions included different tasks that needed to be carried out, depending on the listed individual’s age and gender (for example placing a check mark next to male persons). The assessment again entailed the number of errors they committed (omission and commission errors), as well as completion time. (See Appendix C)

Room layout. A seating scheme was presented in form of a 5x5 grid, where the rows were numbered. A letter from “A” to “E” was in each of these 25 cells, identifying an employee from one of five companies (company A, B, C, D, and E). Five questions of increasing difficulty were asked about the relative positions of certain company employees. The assessment of this task entailed the time it took them to answer the questions and the number of errors they committed. Timing commenced when the participant was first presented with the seating scheme and questions. (See Appendix D)

Robert Morris Attention Scale (RMAS). This scale is a brief self-report measure of general attention. It consists of five items and shows good internal consistency, test-retest reliability, and criterion validity. More specifically, Kelly (2009) reported a test-retest reliability of .81. The criterion was established through correlations with other measures of attention, such as the Differential Attentional Processes Inventory, the Self

Regulation Scale, and the Digit Span Forward subtest of the Wechsler Adult Intelligence Scale–Revised. There is no significant relationship between the RMAS and social desirability, and it is considered a potential viable alternative to performance-based measures of attention (Kelly, 2009; see Appendix E).

Behavioral Rating Inventory of Executive Functions – Adult Version

(BRIEF-A). The BRIEF-A is a standardized behaviour self-rating inventory that consists of several scales. Those scales include Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials, Self-Monitor and Task-Monitor (Roth, Isquith, & Gioia, 2005). The Global Executive Composite (GEC) represents the summary score of the BRIEF-A, and was thus used in this study. According to Roth et al. (2005), the GEC has high internal consistency (with alpha coefficients ranging from .93 to .98) and high test-retest reliability (with a correlation value of .94). Convergent and discriminant validities were tested with several measures, including the Dysexecutive Questionnaire and the Frontal Systems Behavior Scale. The results of these studies were overall supportive of the applicability of the BRIEF-A for testing EFs. In addition, an item analysis conducted by professionals in the field resulted in agreement of item membership among the nine indexes ranging from 35% (self-monitor) to 98% (emotional control). . This measure was added to examine the EFs of the participants in depth.

Background questionnaire. Participants were asked to fill out a short background questionnaire developed for the purpose of this study to determine some of their background information. The purpose of this questionnaire was to assess whether the participants matched the criteria of the study they read before signing up for it. That is, it

was to validate that they had never been diagnosed with a learning disorder and that they experienced problems focusing their attention on a given task, controlling and regulating distractions, or working toward a desired goal. If a participant admitted to trouble with attentional functioning, the participant was asked to elaborate on their specific difficulties. (See Appendix F)

Experimental group only. Certain parts of the study were only completed by the experimental group. This included the GMT and a Feedback Questionnaire.

Goal-management training. The GMT was also based on Levine et al. (2000). This intervention took approximately 45 minutes and covered the five steps of GM described earlier (that is, 1: stop, 2: define main task, 3: list steps, 4: learn steps, and 5: check; see Appendix G). The participants received a handout to follow along with the presentation, which they were allowed to use to make notes and keep after the study was completed. (See Appendix H)

Feedback questionnaire. This questionnaire was designed specifically for the purpose of this study to address the qualitative changes in the participants' GM skills. It consisted of five rating questions and three questions in which participants were asked to provide written feedback about the effectiveness of the study (see Appendix I).

Control group only. Certain parts of the study were only completed by the control group. This included the distractor task that in itself included five different measures.

The distractor task included five types of activities (namely, a picture observation task, the Dissociative Experiences Scale, a picture recognition task, a word recall task, and a word recognition task) and took approximately 45 minutes to complete. These

tasks were chosen because they do not provide elements of the GMT and were of interest as part of another research question.

Picture observation task. Participants were shown 12 pictures of stereotypical scenes (such as a wedding or a beach scene) on a computer screen for ten seconds each, with the task of remembering as many things as possible. The pictures are identical to those used by Miller and Gazzaniga (1998) and Carstens and Webster (2008).

Dissociative Experiences Scale (DES). This scale is a 28-item self-report measure of dissociation and took approximately ten minutes to complete. Dissociation can be conceptualized as an experience of de-realization or de-personalization. The participants were asked to indicate the frequency of their dissociative experiences on a scale from 0 to 100 with intervals of 10. The reliability and validity (that is, internal validity, test-retest reliability, and construct validity) of the DES to measure dissociation has been reported by several authors (for example, see Carlson & Putnam, 1993).

Picture recognition task. The participants were shown a second set of 12 pictures. This set included five original and seven altered pictures of the same stereotypical scenes as in the previous set. The altered pictures contained two additional items and had two items removed. The subjects were asked to indicate whether each picture was identical to one from the Picture Observation Task and also to rate their level of confidence in their decision on a likert-scale from 0 (not confident) to 3 (very confident). The number of altered pictures incorrectly recognized was the measure of false memories, with the likert-scale rating being an indicator of the quality, or strength, of the false memories. (See Appendix J)

Word recall and recognition task. The participants completed three word recall tasks that were based on an experiment by Roediger and McDermott (1995). They were presented with three lists, one after another, that consisted of 15 words each with the task to remember as many words as possible (with the lure words sleep, chair, and sweet; see Appendix K). After each list, they were asked to recall as many words of the previous list as possible. Each list was strongly associated with one specific lure. Their recall of the lure was the measure of false memory creation.

After the word recall tasks, each participant was presented with a word recognition task. Here, they were shown 21 words of which six had been presented on the word lists, six had not been presented but were related to the presented words, six had not been presented and were not related to the presented words, and three lure words. They were asked to indicate whether each word had previously been presented and rate their certainty of that decision on a likert scale from 0 to 3 (0 = not certain at all, 3= very certain). Their responses on this recognition task served as a measure of false memory creation, as well as the magnitude of those memories. (See Appendix L)

Statistical Design

For the major analyses concerning Hypothesis 1 I conducted a repeated measure analysis of variance (ANOVA) with one between-subjects factor. The independent variables were Prepost (whether the score was from the pre-assessment or the post-assessment) and Group (whether the score was from a participant in the experimental or the control group). The major dependent variables were completion time (summed across all GM tasks) and errors (also summed across all GM tasks).

CHAPTER IV

ANALYSIS OF RESULTS

Preliminary Analyses

The sample size was 141. Among this sample, 14 participants were excluded because they did not meet the previously mentioned criteria. In addition, three participants were excluded because they did not properly follow the instructions that were given to them. The remaining sample consisted of 124 participants. Both the experimental and control group consisted of 62 participants. After 31 participants completed the study in each group, the order of the two versions was switched, so that the first 31 participants received version A of the goal management skills tasks followed by version B and the last 31 participants received version B followed by version A.

Outliers. Two participants had an error rate and completion time greater than three standard deviations from the mean, and were thus identified as outliers. Testing the assumptions of the ANOVA with and without the outliers resulted in an increase in violations when including them, which warranted the removal of the outliers for the subsequent analyses. Both outliers were part of the control group. The final data file consisted of 122 participants in total ($N = 62$ in the experimental group and $N = 60$ in the control group).

Background variables. Participants were between 18 to 65 years old with a mean age of 23 ($SD = 7.21$). The majority of students were Psychology majors (46.7%; either as single-major or double-major) and spoke English as their first language (78.5%). Ninety-three participants were female and 29 were male.

Assumptions. The first assumption, that of independence of observations, is violated if any scores of participants in the data set are not independent of the other participants in the same set. Because the participants were tested in small groups, it is possible that there is some dependence among each group. For example, the completion time of one participant may have influenced another participant to perform in a different manner in order to be more similar to the other group members. However, because the data were collected on several occasions, in these instances it is assumed that those effects are counterbalanced.

Following this, the assumption that the distributions of scores within groups is normal was tested. An analysis of the skewness and kurtosis values was performed where skewness values above -2 and below 2 and kurtosis values above -3 and below 3 indicated no violation of this assumption. The analysis of the total amount of time and errors of the pre- and post-assessment measures yielded no violation of this assumption.

The assumption of sphericity is met when the variances of the differences between treatment levels are equal. Because measurements have only been taken on two occasions, sphericity is not of concern. The next assumption is that of homogeneity of variance, which assumes that the variances of the samples are equivalent or not excessively different. The Levene's Test was significant ($p < .05$) for the total time of the goal management skills measures at the post-assessment. This means that this assumption was partly violated, suggesting that the variances within the groups was significantly different. However, an ANOVA is assumed to be robust against such a violation if the sample sizes are relatively equal (that is, the ratio of the sample sizes is not above 1:1.5), which is the case in this sample. The last assumption is that of

homogeneity of covariance, which assumes equality of the sample treatments variances. The Box's M test was used to test this assumption. It showed that none of the values was significant, indicating that the covariances of the groups were not significantly different from each other.

The analyses necessary to investigate the hypotheses are based on the assumption that the samples of both groups (experimental and control) are similar in their reports of executive functioning and attention difficulties. To establish this, independent sample t-tests were used to compare the participants' self-ratings on the BRIEF-A (the GEC) and on the RMAS, and the amount of problems they reported on the Background Questionnaire. The GEC raw scores were converted into t-scores using the BRIEF-A Manual. The t-tests of the GEC t-scores and the RMAS yielded a significant group difference ($t(119) = 2.14, p \leq .05$ and $t(120) = 2.28, p \leq .05$, respectively), whereas the number of problems reported on the Background Questionnaire did not differ significantly between the groups. One can see in Table 3 that the experimental groups scored higher on both the GEC and RMAS, which means that they overall, according to their self-report, experienced more difficulties with their executive and attentional functioning. As an additional analysis, it was established whether the experimental group and control group differed in their number of participants who received a GEC t-score of 65 or higher. Five participants in each group fell into this category, and thus the chi squared analysis revealed no significant difference between the experimental and control group (with a chi-square value of .003; $df = 1; p > .05$).

Even though the experimental and control groups statistically differed significantly from each other on the GEC t-scores and RMAS scores, the mean scores of

both groups were in the average range. More specifically, the difference between the groups was only 2.7 on the GEC t-scores and 1.3 on the RMAS, and thus further investigation was warranted. Subsequent analysis did not show a difference between the two groups on the pre-assessment of the GM skills measures. Therefore, it does not appear that the experimental and control groups experienced clinically significant differences in their level of attentional problems before the intervention for the experimental group.

Table 3

Descriptive Statistics of Each Group's GEC T-scores, RMAS, and Amount of Problems Reported on the Background Questionnaire

Group	GEC t-score (<i>M, SD</i>)*	RMAS (<i>M, SD</i>)*	Reported Problems (<i>M, SD</i>)
Experimental	56.73, 6.03	18.15, 2.42	2.00, .73
Control	54.03, 7.74	16.84, 3.46	2.08, .71

* significant difference between the two groups at $p \leq .05$

It was further established that there were no significant differences between version A and version B of the goal management tasks. More specifically, two independent-sample t-tests were conducted to compare the two versions (that is, which version of each task they completed first) on the total number of errors and completion time of the pre-assessment. No significant results were found ($p > .05$), indicating that the participants did not perform significantly different depending on which version of the

tasks they were given at pre-assessment. More specifically, the results for errors and completion time on the pre-assessment were $t(120) = -1.62$ and $t(120) = .62$, respectively.

Hypothesis 1

The first hypothesis stated that GMT would improve the participants' performance on goal management tasks relative to a control group in which participants performed memory tasks and thus did not receive GMT. The total number of errors and the total time it took them to complete the tasks were used as measures of their performance. It should be noted that the two groups did not differ significantly on the total errors and completion time on the pre-assessment measures, which was established by using two independent-sample t-tests. This analysis showed no significant differences between the groups on the pre-assessment despite their differences in self-report on the GEC and RMAS (that is, $t(120) = -.85$ for errors and $t(120) = .62$ for completion time, with $p > .05$ for both). A repeated measure two by two ANOVA with one between-group factor was used to compare the number of errors and completion time of both groups on their pre- and post-measures. This analysis revealed a significant Prepost main effect for completion time, indicating that both experimental and control groups significantly improved on completion time from the pre- to the post-measure with a Wilks' Lambda value of .45 ($F_{(1, 120)} = 147.62, p \leq .01$, partial $\eta^2 = .55$). According to Cohen (1988), a partial η^2 of .1 is a small effect size, a partial η^2 of .25 is a medium effect size, and a partial η^2 of .4 is a large effect size. Thus this effect is large. In addition, there was a significant Group X Prepost interaction effect of completion time between the groups with a Wilks' Lambda value of .97 ($F_{(1, 120)} = 4.35, p \leq .05$, partial $\eta^2 = .04$). That is, the experimental group showed a significantly greater improvement in time than the control

group (see Table 4 and Figure 1). No significant main effect for Group was observed ($p > .05$), indicating that the average completion time across the pre- and post-assessment was not significantly different in the experimental and control group.

Table 4

Descriptive Statistics of Each Group's Completion Time

	<i>N</i>	<i>M</i> (in sec.)	<i>SD</i> (in sec.)
Pre-assessment			
Experimental Group	62	463.92	82.54
Control Group	60	454.19	92.56
Post-assessment			
Experimental Group	62	362.61	73.91
Control Group	60	382.52	98.71



Figure 1. Average completion time of both groups during the GMT pre- and post-assessment.

No significant reduction in the numbers of errors was observed in the experimental or control group ($p > .05$, partial $\eta^2 = .02$), as well as no significant Group X Prepost interaction effect ($p > .05$, partial $\eta^2 = .00$; see Table 5 and Figure 2). Furthermore, no significant main effect for Group was observed in terms of error rate ($p > .05$).

Thus, the first hypothesis was partially supported. That is, participants who received GMT improved significantly more in their completion time than participants who did not receive GMT. However, although both groups reduced their total number of errors, the experimental group did not significantly differ in this regard from the control group.

Table 5

Descriptive Statistics for Errors

	<i>N</i>	<i>M</i>	<i>SD</i>
Pre-assessment			
Experimental Group	62	23.87	17.80
Control Group	60	26.87	20.97
Post-assessment			
Experimental Group	62	21.15	22.33
Control Group	60	24.35	21.14



Figure 2. Average number of errors of both groups during the GMT pre- and post-assessment.

Because the GM skills tasks vary in terms of complexity, a more in-depth analysis was performed of the errors and completion time of each measure (that is, proofreading, grouping, and room layout task). For this, six additional repeated-measure ANOVAs with one between-group factor were performed that included the completion time and total errors for each of the three tasks separately. The Bonferroni correction was used to control for Type-1 error and was based on grouping the time and errors of each task together. Thus, the α -level of .05 (for time) was divided by three (as there were three tasks), which resulted in a new α -level of .016. As can be seen in Table 6, there was a

significant main effect for Prepost across the groups on the room layout task in terms of total errors, and completion time ($p \leq .016$, partial η^2 of .11 and .71, respectively).

Table 6

Results of the Repeated Measure ANOVAs of Each Goal Management Skill Task

	<u>Total Errors</u>		<u>Time</u>	
	<i>p</i>	partial η^2	<i>p</i>	partial η^2
Proofreading				
Pre-post difference	.49	.00	.30	.01
Pre-post difference*Group	.64	.00	.79	.00
Grouping				
Pre-post difference	.28	.01	.03*	.04
Pre-post difference*Group	.94	.00	.05*	.03
Room Layout				
Pre-post difference	.00**	.11	.00**	.71
Pre-post difference*Group	.36	.01	.02*	.05

* significant at $p \leq .05$

** significant at $p \leq .016$

These analyses further indicated only one main effect for Group, more specifically for the error rate on the room layout task ($p \leq .016$, partial $\eta^2 = .10$). This indicated that, on this specific task and across the pre- and post-assessment, the experimental group had overall fewer errors than the control group. The Group main effect for errors and completion time on all other tasks was non-significant ($p > .05$).

Although not significant with the newly established α -level of .016, the Group X Prepost interaction for the room layout task approached significance ($p = .02$, partial $\eta^2 = .05$). As there was an overall difference between the groups in completion time, this result supports the previous findings, also indicating that the two groups may have shown a difference in the degree of improvement in their response times on this task. Figure 3 illustrates this trend.

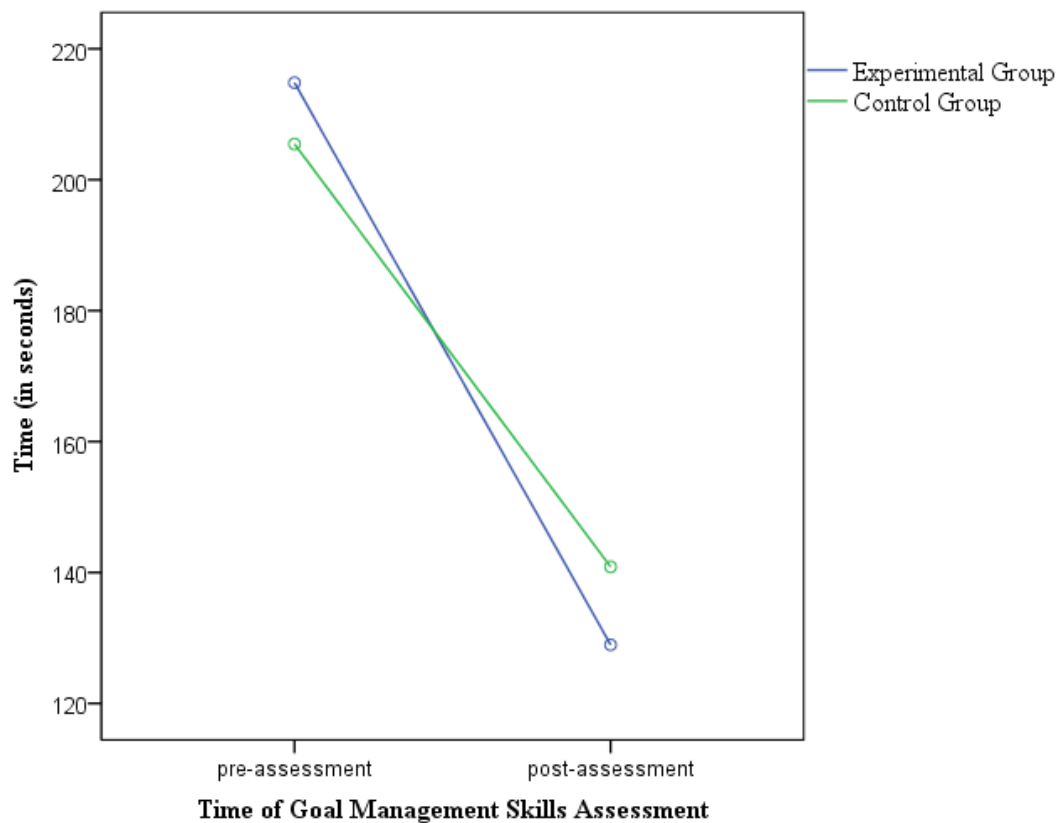


Figure 3. Average completion time of both groups during the room-layout task pre- and post-assessment.

As there was a significant main effect for Prepost in the total number of errors on the room layout task, two additional repeated-measure ANOVAs with one between-group

factor were conducted to investigate the omission and commission rates of errors on this specific task. These analyses yielded a significant main effect for Prepost for overall commission errors ($p \leq .016$, partial $\eta^2 = .08$), but no significant results for omission errors ($p > .016$). As the participants were able to guess the answer during this task, and thus were less likely to leave an answer blank, this finding is not surprising, given the significant difference in total errors on the room layout task that was previously found. There was no significant Group X Prepost interaction effect for either commission or omission error rate ($p > .016$). Furthermore, there was a significant main effect for Group in terms of commission errors, indicating that, overall, the experimental group committed fewer errors ($p \leq .016$, partial $\eta^2 = .09$). No significant main effect for Group was found for omission errors ($p > .05$).

For completion time on the grouping task, the main effect for Prepost ($p = .03$, partial $\eta^2 = .04$) and the Group X Prepost interaction ($p = .05$, partial $\eta^2 = .03$) approached significance. Thus, the grouping task also revealed some differences in the change of completion time between those who received GMT and those who did not, which again supports the overall conclusion. As mentioned before, there was no significant main effect for Group on this task ($p > .05$).

To further analyze the data, another two repeated-measure ANOVAs with one between group factor were conducted (for total errors and time), which only included participants with an RMAS score of 18 or higher, or a GEC t-score of 56 or higher. These cutoff values were based on the mean of each measure (17.54 for RMAS and 55.37 for the GEC t-score). This was done in order to establish the difference between total

errors and completion time among participants who reported relatively high scores of attentional and executive functioning difficulties.

First, the participants were split according to their GEC t-scores where participants with a value of 55 or lower were excluded. This resulted in a total of 60 participants (35 in the experimental group and 25 in the control group). For errors, there was no significant Prepost main effect, Group main effect, or Group X Prepost interaction effect ($p > .05$). However, there was a significant Prepost main effect for completion time ($p \leq .05$, partial $\eta^2 = .59$), but no significant Group main effect or Group X Prepost interaction effect for completion time ($p > .05$).

After splitting the participants according to their RMAS scores and excluding participants with a value of 17 or lower, the total number of participants was 72 (42 in the experimental group and 30 in the control group). The results were in accordance with the previous analysis as there was no significant Prepost main effect, Group main effect, or Group X Prepost interaction effect for errors found ($p > .05$) but a significant Prepost main effect for completion time between the pre- and post-measures overall ($p \leq .05$, partial $\eta^2 = .58$). Consistent with the previous analysis, no significant Group main effect or Group X Prepost interaction effect was found for completion time ($p > .05$).

Hypothesis 2

The second hypothesis stated that there would be a negative correlation between the severity of the participants' self-reported executive functioning and attentional difficulties, and their speed and accuracy on the pre-assessment measures of their GM skills. A one-tailed Pearson r correlational analysis was performed, which showed that there were significant negative correlations between the error rate and the GEC t-scores

($r = -.18, p \leq .05$) and RMAS scores ($r = -.34, p \leq .01$). This indicated that, the higher the participants' self-report of attentional or executive functioning difficulties on these measures, the fewer errors they committed overall on the pre-assessment measures of goal management skills. The participants' GEC t-scores and RMAS scores did not correlate significantly with their total completion time ($r = -.12, p > .05$ and $r = -.13, p > .05$, respectively), indicating that their degree of experienced difficulties does not relate to the rate at which they completed the pre-assessment tasks. According to Cohen (1988), a Pearson r value of .1 to .23 is considered a small effect size, a value of .24 to .36 a moderate effect size, and a value of .37 and above a large effect size.

To further analyze whether there was a difference between the number of errors or completion time at the pre-assessment of participants who reported experiencing either one, two, or three of the problems mentioned on the Background Questionnaire, a chi-squared analysis was performed. This showed no significant results ($p > .05$), and thus participants did not differ in their performance based on those ratings. Because of these results, and the previously mentioned significant negative correlations between participants' error rate and the self-report measures of attention and executive functioning (that is, $r = -.18$ for GEC t-scores and $r = -.34$ for RMAS), the hypothesis that participants with more difficulties in attention and EFs would perform more poorly than those with less difficulties was not supported.

Additional Analyses

In order to establish whether the participants of the two groups differed in their performance depending on age, two independent-sample t-tests were performed. They included one for the total errors and one for the total amount of time of the pre-

assessment of their goal-management skills. This analysis yielded no significant results ($t(120) = -.85$ for errors and $t(120) = .62$ for completion time, with $p > .05$ for both), indicating that age did not significantly influence their performance on the goal management measures.

The subjective usefulness of the GMT was established with a feedback questionnaire, in which participants had to rate their experience on five questions. The maximum number of points was 25. The mean rating of participants on this measure was 17.76 ($SD = 2.49$, with a range from 12 to 23). The degree of the experimental group participants' executive functioning and attentional difficulties on either of the three measures (that is, GEC, RMAS, and number of problems reported) was not correlated with their responses on the feedback questionnaire that measured the usefulness of the study ($p > .05$). This suggests that the amount of difficulty they experience with attention and executive functioning is unrelated to the perceived value of the intervention.

A review of their answers to the open-ended questions revealed that 10 participants noted they liked the presentation of GMT, 10 liked the interaction and discussion with the researcher, 10 especially liked step 3 of the training (dividing goals into subgoals) and seven liked step 1 (directing attention using a catchphrase). Among the things the participants did not like were the length of the training (10 felt that it was too long, whereas three felt there was not enough time), five participants noted they would have liked more examples and strategies, and four did not like being in a group setting. However, 22 participants noted that they disliked nothing and overall enjoyed the study. Other comments included that they liked having guidelines (10), that they will try to apply them in real life situations (7), and that they liked practicing the tasks (5).

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Overview

The purpose of this study was to further our understanding of the effectiveness of an intervention that is aimed at a person's executive functioning skills. The current study adapted a previously used approach of GMT (Levine et al., 2000) to make it more appropriate for younger adults who have some trouble focusing their attention, managing distractions, or working towards their goals. Previous studies have focused on other populations, such as healthy older adults or people with brain injuries. The participants of this study were undergraduate students at the University of Windsor who were assigned to either an experimental group, who received GMT, or a control group, who did not receive GMT. These groups were compared on their errors and completion time to establish the effectiveness of this intervention. The following sections of the discussion will review the findings of this study. More specifically, the results of the comparisons of the two groups will be discussed in detail, as will the results of the correlations of the goal management skills measures with several measures of attentional and executive functioning. Furthermore, there will be a discussion of the qualitative aspects of this study. Next, potential limitations of this study along with some suggestions for future research and practical implications in this area will be discussed.

Effectiveness of GMT

The first hypothesis was related to the effectiveness of the GMT intervention, that is, the expectation that undergoing the intervention would improve one's performance in terms of error rate and time. Although the number of total errors decreased in both

groups by an average of almost three, the first part of the hypothesis was not supported as no significant effect was observed with regards to the improvement of the total number of errors in either group, or, more specifically, in the experimental group. This means that the reduction in errors (although non-significant) may be due to practice alone.

The second part of the hypothesis was supported, as a significant decline in completion time was observed in both groups. This suggests a practice effect, in which familiarization with the tasks and the procedure resulted in a decrease in completion time. Moreover, the practice effect has a large effect size (partial $\eta^2 = .55$), meaning that it accounts for 55% of the variance between the pre- and post-measures. However, there was also a significant interaction effect, indicating that the experimental group improved significantly more on their completion time from the pre- to the post-measures than the control group did. This analysis yielded a small effect size (partial $\eta^2 = .04$), suggesting that group membership only accounted for 4% of the variance between the groups' pre- and post-measures. The experimental group was somewhat slower on the initial assessment; however, because the two groups were not significantly different on their completion time during the pre-assessment, it is unlikely that the difference between the groups was due to there being greater possibility for improvement for the experimental group. This suggests that it was the intervention that contributed to the faster completion of the tasks, in addition to the observed practice effect.

It is possible that the design of the study augmented the practice effect. That is, the interval between the pre- and post-assessment was only small (approximately one hour) and the participants were mostly young adults. Under these conditions, it is likely

that a greater practice effect is observed. However, the possibility of a practice effect does not indicate, that the intervention itself is not of clinical value.

These results are in accordance with the first hypothesis. It is interesting to note that the improvement occurred in completion time, as another study (Levine et al, 2000) showed that participants actually increased in completion time while decreasing their error rates. The authors of that study proposed that this was due to a more diligent approach to the task by the participants, thus taking more time in general. This assumption was not supported by this study. A possible explanation for these different findings is related to the inherent characteristics of the samples used. Levine et al. (2000) included brain injured patients who may not have been able to perform the tasks faster (even with the intervention), and thus perhaps concentrated their efforts more on improving their accuracy rather than their speed. In contrast to this are the undergraduate students who participated in this study. That is, as they were mostly young individuals who did not have severe difficulties, they may have especially benefitted from practice. Furthermore, the setting of the study may have played a role in them being more concerned with improving their completion time rather than their error rates, as the other individuals in the room (including the researcher) would notice how fast they completed the tasks, but would not know how well they performed on the tasks. As this was a study that used the Participant Pool, and the participants were not necessarily concerned with improving their skills (that is, they received an external reward for participation), it is also possible that they wanted to leave the study as soon as they could, and thus tried to finish the tasks faster. However, even though this may explain the decrease in overall

completion time of both groups, it does not serve as an explanation for the greater decrease in completion time of the experimental group.

Furthermore, although the reduction in total errors was non-significant, there was an overall decrease in errors, which suggests that the trend of errors is the same as that in the previous study (Levine et al., 2000). Thus, the change in time, whether there is an observable increase or decrease, does not seem to be related to the change in error rates but perhaps rather to the population and study design.

Overall, the hypothesis was partially supported in that there was a significant, and significantly different, improvement in completion time in the experimental group compared to the control group, but not in the change in number of errors (that is, there was no significant decrease in errors overall, nor a significant difference in change in number of errors between the two groups). However, it is important to keep in mind that the group membership only accounted for a small portion (4%) of the overall variance in completion time.

These results are different from previous studies of GMT, as they do not show an overall significant reduction in total errors or a significant difference between the number of errors of the experimental and control group. Levine et al. (2000), Levine et al. (2007), and van Hooren et al. (2007) all found a significant improvement in the performances of their experimental group who received GMT (albeit different versions of it) versus their control group who did not receive GMT. One possible explanation is that the incentive for the participants in the current study to complete the study was external, as they received partial credit towards one of their Psychology courses. These participants received their rewards independently of how they performed, which means

that some participants may have not given their full effort during the tasks. This is different from previous studies, as those included participants who were internally motivated to participate in the intervention. As previously mentioned, this could have affected their performance. In addition, the results of this study may be different from previous studies because of the different populations used. That is, the participants in this study were younger and less distressed by their problems than participants in those other studies. Perhaps, this intervention is most promising for individuals with more severe attention and EF difficulties.

Analyzing the goal management skills tasks separately revealed that there was a difference between these tasks. More specifically, the room layout task was the only one in which participants showed significant improvement in terms of commission errors, total errors, and completion time between the pre- and post-measure in both groups. Only a small effect size was noted for commission errors and total errors; however, completion time was shown to have a large effect size. Overall, 71% of the variance between both groups' completion time on their pre- and post-measure can be accounted for, indicating that the practice effect is great. As was the case in the primary analysis of the completion time across the tasks, the effect size of the interaction between group and completion time was only small. That is, only 5% of the variance between the pre- and post-measure was accounted for by group membership. Compared to the other two tasks (proofreading and grouping), this task involved somewhat different executive functioning components. That is, because the instructions were not taken away from the participants (as was the case on the other two tasks), it may have involved less working memory storage, but rather emphasized organizing instructions and dividing them up into sub-

components, in other words the central executive component in Baddeley's working memory model. Consistent with the idea that the central executive may have been a more prominent task demand in the room layout task, this specific assignment seemed to be more effortful than the other two. Perhaps this task is a more appropriate one to measure overall executive functioning, and thus might be the most appropriate of the three in this study for work with older as well as younger adults.

Also of interest was the interaction between group membership and change in completion time on the room layout task from pre-assessment to post-assessment. With a p -value of .02, this difference approached significance (as the Bonferroni correction resulted in a new α -level of .016). As this specific task can be assumed to be an appropriate measure of executive functioning, the fact that there is a difference between the groups (that is, Group X Prepost interaction) supports the hypothesis that the GMT was, at least partially, successful in improving these skills more so than simply the practice effect.

The Prepost main effect, as well as the Group X Prepost interaction effect for completion time on the grouping task also approached significance ($p = .03$ and $p = .05$, respectively). The effect sizes for both differences, however, were only small with 4% and 3% of the variance accounted for, respectively. Although not statistically significant, this trend of the data is also in accordance with the first hypothesis and suggests that both the room layout and grouping tasks contributed to the practice and treatment effect (that is, the Group X Prepost interaction effect) seen in the summary measure.

Overall, the analyses of the data indicate that there was a reduction in completion time and number of errors from the pre- to the post-assessment, although only the former

was significant. In addition, participants who received GMT improved more in their completion time than those who did not receive GMT. Although the effect size of the difference between the groups was only small, this intervention appears to be promising. Given that this is the first study to use GMT with younger adults, more research is needed to determine the efficacy of this intervention with this population.

Subjective Measures and Pre-Assessment Performance

The results of this study are in contrast with the second hypothesis, which stated that individuals who report more attentional or executive functioning difficulties would perform more poorly on the goal management skills tasks before GMT than those who did not report such difficulties. The reason for this was that the goal management skills tasks were assumed to measure these specific features. Contrary to this belief, it was found that there were significant negative relationships between two of the three measures used to determine the participants' self-report of functioning (that is, GEC t-score and RMAS) and the total amount of errors on the pre-assessment of goal management skills. This means that, the more difficulties the participants reported, the less total errors they made at the first assessment. One possible reason for this may be that individuals who are more aware of their cognitive difficulties may also be more aware of their performance, or more successful at self-monitoring their performance, during a task. This possibly indicates greater meta-cognitive abilities. Another plausible explanation for these findings is that perhaps the GM skills tasks tap into EFs that may not be specifically measured by other measures. As was discussed before, EFs are very difficult to define, have many different aspects, and certain tasks appear to make use of particular EFs more so than others (see Miyake et al., 2000). Thus, it is possible that the

GM skills tasks measured certain EFs that were not as directly measured with the BRIEF-A or the RMAS. What these specific EFs could be is, at this point, impossible to define. More research is needed with these specific GM skills tasks and their relationship with other measures of EF (such as the Dysexecutive Questionnaire, for example).

In contrast to the previously mentioned significant correlations, the chi-squared analysis of the Background Questionnaire and the pre-assessment measures did not show any significance, which indicates that participants who reported either low, medium, or high difficulties on this measure performed similarly on the goal management skills tasks. It is important to keep in mind that, contrary to the GEC and RMAS, the Background Questionnaire was developed as a screening measure for this study specifically, and thus its validity is not determined.

One explanation for these findings could be that the goal management tasks did not effectively measure attention or executive functioning. Another possibility is that, because all the measures used were self-report measures, there was a response bias in which some participants overestimated their attentional and executive functioning difficulties. As previously mentioned, perhaps the individuals who reported greater difficulties on the self-report measures were better at monitoring their performance on the GM tasks. It would have been useful to include an objective measure of these features to reach a more reliable conclusion about the suitability of the goal management skills measures.

Qualitative Analysis

Participants in the experimental group were given a feedback questionnaire on which they were asked to rate their experience on five likert-scale questions (ranging

from 1 to 5), as well as to describe the aspects of the GMT they liked and disliked. An analysis of the quantitative questions showed that the mean rating was 17.76, suggesting that, on average, participants found this intervention helpful. The open-ended questions were answered in a great variety of ways. The positive comments of the participants included the interaction with the researcher (that is, the discussion of their personal goals, as well as feedback on how to make them more attainable) and the possession of some general guidelines with which to approach their goals. Most participants noted that especially step 3 (sub-dividing their goal into subgoals) and step 1 (directing attention and making a catchphrase) were most helpful and that they were most likely to use those in the future.

Among the critical comments were, for example, that participants felt they had too much time to go over the steps and that they would have liked more examples. The verbal feedback that some participants provided to the researcher in addition to the written one was very positive in general.

Methodological Limitations

It is important to keep in mind several limitations of this study that could possibly have had an effect on the results. The first limitation is the fact that the experimental and control group had a different overall experience during the study. That is, the experimental group received the GMT, which does not only mean that they learned possibly helpful strategies for their goal management, but also that they interacted closely with the researcher throughout the study. The participants in the control group also interacted with the researcher, but to a lesser extent. More specifically, during the distractor task, the researcher explained the different tasks to the participants, but, in

contrast to the procedure for the experimental group, these tasks (tasks on the computer and questionnaires) were all performed without interacting with the researcher. The experimental group participants received encouragement from the researcher to try these new strategies, thus they were aware that they were learning strategies that might be helpful in managing their skills and, specifically, performing on the tasks. This may have led them to act in a certain way that they felt was expected of them. In this case, these so called *demand characteristics* possibly involve putting more effort into the tasks on the post-assessment, as the participants in the experimental group feel that they have received a helpful intervention and are thus expected to perform better. In addition, it is possible that rapport has been established between the researcher and participants in the experimental group, so that they want to perform as is “expected” of them.

Another limitation, as previously mentioned, involves the goal management skills measures and that they may not have been very successful in measuring executive functioning of the participants. The correlations between the participants’ performances on the tasks and their self-report of attentional and executive functioning difficulties need to be further studied so that more appropriate measures can be developed. Furthermore, because this study involved only undergraduate students, the results may not be generalizable to other young adults. Future research designs should include a more general sample of younger adults.

Future Research and Practical Implications

There are several other possible alterations that can be included in future research designs based on this study. First, studies could include only participants who are internally motivated in learning strategies that may help them reach their goals. For

example, this intervention could be offered as a training program for new, incoming students to a University, especially those who experience anxiety or distress about attending University. In that case, it is possible that simply showing them that practice can affect performance may be beneficial for them. Additionally, more in-depth sessions could be offered that cover more examples and more strategies. Furthermore, it would be interesting to investigate the long-term effects of the intervention through a follow-up testing session after three or six months, for example. Finally, other populations could be targeted, as for example older healthy adults, as some previous interventions did not include any control groups. In addition, there are other aspects that could be added to the intervention that may increase the benefits, such as training in prospective memory. This was initially suggested by Levine et al. (2000) but has not yet been introduced in any recent study designs.

As hypothesized, participants who received the GMT improved on their completion time on the goal management skills tasks more than the control group. In contrast to the expectations, however, neither group significantly improved on their error rates and there was no significant difference noted between the groups. This suggests that, although the intervention appears to have been successful in improving participants' time, the actual difference between the two groups was rather small, indicating that the greater part of the improvement in this paradigm may have been due to practice effects. While not feasible given the circumstances of the present study, in the future researchers might consider providing additional sessions of GMT and inserting a longer interval between the pre- and post-assessment in future studies to see whether these changes

reduce the relative importance of practice and suggest a clearer benefit from the intervention.

This study was to further our understanding of this training strategy with an undergraduate population to possibly implement an intervention (such as a workshop) that can be presented to incoming students to help them with their goals, not only during their academic training but in other aspects of their lives as well. As it was mentioned in the previous section, there are many ways in which research with this intervention and this population can be expanded in the future. The trend of the results towards an improvement on both errors and time along with the generally positive comments of the participants themselves warrants more research in this area.

APPENDICES

APPENDIX A

Participant Pool Advertisement

“You will be asked to fill out self-report measures regarding your attention and executive function skills, as well as a short background questionnaire. You will also be assessed on your goal management skills by doing short paper-and-pencil tasks. This study will take no more than 120 minutes of your time, and is worth 2 bonus points if you are registered in the pool and you are registered in one or more eligible psychology courses. If you choose to withdraw from this study before it is completed, you will receive .5 bonus points for attending. Please only sign up for this study if you have never been diagnosed with a Learning Disorder and have problems focusing or maintaining your attention on a given task, controlling and regulating distractions, or working toward a desired goal.”

APPENDIX B

Everyday Paper-and-Pencil Tasks – Proofreading

The instructions and the stories will be presented to the participants on separate sheets of paper in each version.

Version A:

Instructions:

Read the following paragraph and circle each number, underline all the fruits and vegetables, cross out all liquids, and draw a box around animals. Do not take any notes on the next sheet of paper. Work as quickly as you can without making any mistakes.

Mr. Jones was swallowing the last drop of his coffee when he realized that his cat was chasing two mice in the living room. His wife had made him a lunch package for work before she left the house, which included two apples, one sandwich, and one carton of milk. He looked out the window and saw three carriages, each with two beautiful horses that were currently eating carrots. He was glad that his dog, Bobby, was currently drinking water and had not noticed this scene outside because he would have started to bark. Just then, Mr. Jones became hungry and looked in the fridge for food. There were two pies in it, but he chose a banana and an orange, along with some tea.

Version B:

Instructions:

Read the following paragraph and circle each city, underline all means of transportation, cross out all sites of nature, and draw a box around all names. Do not take any notes on the next sheet of paper. Work as quickly as you can without making any mistakes.

Mrs. Smith and her daughter Laura had always dreamed of taking the train around many different cities in Italy, such as Rome and Bari. It had been their first time on an airplane and they were very nervous, but Amy, the nice woman who sat beside them, had calmed them down a bit. They took a taxi from the airport in Frankfurt to the hotel and saw a beautiful lake. After a good night's sleep, they arranged a 10-day tour with Jimmy, the tour guide, to see the different mountains and rivers in Italy. They also planned to see Venice, Florence, and Naples. They got to take a boat when they visited Palermo. They saw a beautiful waterfall on the last day, which was the highlight of their trip.

APPENDIX C

Everyday Paper-and-Pencil Tasks – Grouping Instructions and Grids

The instructions and the Grouping Grid will be presented to the participants on separate sheets of paper.

Instructions

Version A:

Take a look at the “Grouping Grid” and classify each individual in the following way: Number each person under the age of 25 with a “1”, and each person over the age of 35 with a “2”. Place a check mark next to the females, and circle each individual who is both over the age of 25 and male. Do not take any notes on the next sheet of paper. Work as quickly as you can without making any mistakes.

Version B:

Take a look at the “Grouping Grid” and classify each individual in the following way: Number each person under the age of 35 with a “1”, and each person over the age of 45 with a “2”. Place a check mark next to everyone who is male, and circle each individual who is both under the age of 45 and female. Do not take any notes on the next sheet of paper. Work as quickly as you can without making any mistakes.

Grouping Grids

Version A:

23 M	58F
19 M	49M
31 F	44 F
68 M	24 M
29 F	81 F
72 F	38 F
22 F	24 F
17 M	18 M
22 F	31 F
34 M	17 F
15 M	20 F
30 F	28 F
24 M	39 F
34 M	29 M
17 M	26 F
29 F	33 F
28 M	31 F
17 M	21 F
48 F	39 M
29 F	80 F
27 M	37 F
31 F	41 F
46 M	64 M

Version B:

23 F	58F
19 M	49M
31 M	44 F
40 M	24 M
29 M	81 F
72 F	38 M
60 F	40 M
17 M	51 F
22 M	66 F
34 M	36 F
15 F	38 M
53 F	28 M
44 M	39 M
36 M	40 M
42 M	26 F
29 F	68 F
44 M	31 F
38 M	82 F
48 F	39 F
69 F	80 F
27 M	37 M
31 F	41 F
46 F	64 M

APPENDIX D

Everyday Paper-and-Pencil Tasks – Room Layout Task

(The instructions and the Room Layout Grid were presented on separate sheets.)

Instructions:

In the grid below, each cell has a letter from A to E that represents 5 different companies. Use this grid to answer the following questions. Work as quickly as you can without making any mistakes.

Version A:

1) What company is three below the B in row 1?

Answer: _____

2) What company is one below, three to the right, and one above B in row 2?

Answer: _____

3) What company is one row below and the second to the right of the first E in row one?

Answer: _____

4) Start at the B in the first row and follow the companies in a counter-clockwise manner. What company is two to the left of the second C you come to?

Answer: _____

5) Start in the lower left-hand corner and follow the companies in a clockwise manner. What is the second company after the company between the third E and the second C?

Answer: _____

Version B:

What company is three to the right of the E in row 3?

Answer: _____

- 1) What company is two above, three to the left, and one below of the second C in row 4?

Answer: _____

- 2) What company is one row above and the second to the left of the second D in row 3?

Answer: _____

- 3) Start at the A in row 5 and follow the companies in a counter-clockwise manner.
What company is three to the right of the third B you come to?

Answer: _____

- 5) Start in the upper right-hand corner and follow the companies in a clockwise manner.
What is the third company after the company between the third D and first A?

Answer: _____

Grid

	1	2	3	4	5
1	A	E	B	E	C
2	A	B	C	D	E
3	D	E	A	B	D
4	B	A	D	C	C
5	A	C	E	D	B

APPENDIX E

Robert Morris Attention Scale

Using the following scale, please circle the **ONE** answer which best indicates how much you **typically** disagree/agree with each statement. That is, how would you describe yourself **in general**?

1. I often have trouble keeping my mind on what I'm doing. +

Strongly disagree Disagree Not sure or neutral Agree Strongly agree

2. When facing a task that I'm not interesting in, I'm usually able to pay attention anyway.

Strongly disagree Disagree Not sure or neutral Agree Strongly agree

3. It's easy for me to pay attention and concentrate on my activities.

Strongly disagree Disagree Not sure or neutral Agree Strongly agree

4. Frequently when I'm working, I find myself attending to other things. +

Strongly disagree Disagree Not sure or neutral Agree Strongly agree

5. I often find myself paying attention to other interesting yet unrelated activities instead of focusing on the task at hand. +

Strongly disagree Disagree Not sure or neutral Agree Strongly agree

+ denotes reverse scored items.

APPENDIX F

Background Questionnaire

Age: _____

Academic level (e.g., first-year student): _____

Major: _____

Gender: _____

Have you ever been diagnosed with a Learning Disorder? ____ Yes ____ No

If yes, please specify: -

Do you have problems with maintaining attention? ____ Yes ____ No

If yes, please specify:

Do you have problems regulating distractions? ____ Yes ____ No

If yes, please specify:

Do you have problems working towards a desired goal? ____ Yes ____ No

If yes, please specify:

APPENDIX G

Goal Management Training – Script

In this section of the study, the researcher will familiarize the participants with the Goal Management Intervention strategy. This is a very interactive process and the participants are encouraged to ask questions and provide examples.

“When signing up for this study, you read that the advertisement asked you to only sign up if you experience some problems maintaining attention, regulating distractions, or working towards a desired goal. The reason for this is that this study involves Goal Management Training, which was initially developed by researchers in Toronto. Initially, it was developed for other populations, such as healthy older adults or people who experience some kind of cognitive decline. For this study, I adapted the training to make it more suitable for undergraduate students who have reported some problems with attention and attention related aspects. A lot of people have some problems with their attention, but not to a very severe degree.

As you can see on the handout, GMT has 5 stages that can be used to attain your goals better. During this presentation, I will go over each step and provide some examples. This presentation was planned to be very interactive, so I will ask each one of you to share experiences that you have had that relate to the steps, or to give examples. As I said during the consent procedure, you don’t have to share anything if you feel uncomfortable doing so. After I talk about each step, I will leave the room for a couple of minutes to give you the opportunity to practice what each stage entails.

Do you have any questions before we begin?”

“The first step is: **1) STOP!**, which entails orienting and alerting to tasks. During this task, the intention is to assess one’s current state of affairs and attend to relevant goals. Some people have found it helpful to make up a catchphrase that literally “catches” them when they get off track. I put two examples here on the slide, which are “Stop” and “Wait a minute”. As you can see, they are rather short and “sharp” in a sense. Have any of you ever used a catchphrase before?”

Students are encouraged to share their experiences. In addition, they are encouraged to generate several catchphrases, to write them down and then practicing using them. They are even encouraged to, for example, think distracting thoughts or engage in small talk with their neighbour, while concurrently practicing thinking about and getting used to using the catch-phrase the participant created.

“Now, when I leave I would like you to make up one or two catchphrases that are meaningful to you , something that you are likely to remember. This will only take a short time, so for the rest of the time I encourage you to distract yourselves. You can, for example, talk to each other, read something, or text somebody if you like. While you are doing that, however, I want you to practice using your catch-phrase every once in a while. This might seem like a long time, but it is useful to practice it.”

Researcher leaves the room. Upon returning, the researcher asks the participants about their experiences.

“What did you think? What were your catch-phrases? Were they helpful? Do you think this is something you could see yourself using in the future?”

“The next step is **2) Define the main task**, which involves setting the overall goal.

There is some research that I would like to share with you. Goals are generally assumed to be helpful because they impose a structure on one’s behaviour by controlling the activation and inhibition of behaviour that facilitates task completion. They make one’s behaviour more consistent.

One study that might be of interest to you found that approximately 25% of university students never graduate from their program. The majority of students take longer than their program requires and there are several reasons for that, including a lack of clear goals. Other reasons are, for example, lack of motivation and poor overall academic progress.

One study that was published last year involved an online goal-setting program. The researcher set up this online program and through that provided the students with a way to set and track their goals. Students were randomly assigned to two groups, one of which

was provided with this program and the other one was not. The group that had access to the online program had overall a higher GPA, a higher likelihood to maintain a full course load, and lower negative affect.

So, in conclusion, goals tend to increase performance because they are strong motivators. I will tell you a little bit more about what characteristics of goals make them more attainable and you more successful in reaching them.”

Students are encouraged to think of several specific examples to use for this session.

“Now, I would like you to try and think of one or two goals that you currently have in your life and we’ll use those during the next steps”

Researcher leaves the room. Upon returning, the researcher asks the participants to share their goals, and if necessary adapt them to fit the utility of the training method.

“The next step is: **3) List steps**, where you divide your goals into smaller subgoals or steps toward that goal. Sometimes, when one focuses on reaching a performance outcome, or is involved in a new or complex task for example, it can lead to “tunnel vision”. That is one reason why it is important to make smaller goals.”

“There are certain characteristics of goals that may make it easier to achieve them. First, specific goals are better than vague goals. Providing specific goals makes it easier to track your progress towards them. For example, saying “I want to do better in school” is a rather vague goal, whereas saying “I want to achieve 75% on this essay” is more specific.”

“Another characteristic is the level of difficulty of the goal. That is, challenging goals are typically better to set. It is important to keep in mind, however, framing the goal in a way that is not threatening to oneself. If it becomes too challenging, and thus threatening, one can easily feel overwhelmed and feel a lack of self-efficacy, which influences your performance. If a person has a very challenging goal, one possibility is to set a “learning goal”, which involves first focusing on the skills that one needs in order to achieve the overall goal. For example, if my goal is to write a 20 page research paper, but I have never done it before and this is thus threatening for me, I might consider visiting the

writing center as one of my subgoals. That way, the goal remains challenging, but may be less threatening and overwhelming to me.”

“Last, is the proximity of the goal. While it is good to set long-term goals, it is also important to have more short-term, or proximal goals. Achieving smaller goals along the way towards the overall goal not only makes it easier to track one’s progress, but it is also motivating to reach those goals.”

Students are encouraged to select the most complex goal that they developed in step 2 and work towards the identification of subgoals. “Now I will leave the room again for a couple of minutes and I want you to think of some steps that you need to have in order to achieve your goal. Try to keep those three characteristics in mind while you are doing this.”

Researcher leaves the room. Upon return, the participants are again asked to share their steps. The researcher may provide some feedback and suggestions.

“What did you think about this step? Would that be something you might find helpful for you in the future?”

“The next step is: **4) Learn steps** through encoding and retention of subgoals. One strategy that some people have found to be helpful is called “visualization”. Have any of you ever heard of visualization, or used it?”

Participants’ familiarity with visualization will be discussed.

“It involves visualizing yourself doing a certain task. Athletes, for example, often use it to practice because it has been shown that visualizing a certain race or performance in one’s mind’s eye actually improves their physical performance. But it can also be used in more general situations. When you visualize yourself doing something, it is important to make it as similar to real life, and thus to include as many details as possible. For example, try to include all your senses; what you feel, smell, see, hear, think, and so forth”.

Students are encouraged to practice the discussed technique with the subgoals they have developed in step 4.

“Now I will leave the room again for a couple of minutes, and I would like you to try and visualize yourself going through the steps that you provided and then reaching your goal.”

Researcher leaves the room. Upon returning, the participants' experiences are discussed.

“What did you think of this strategy? Did you find it helpful? Did you find it difficult? Some people find it more difficult at the beginning, but once they have practiced it, it becomes easier and more natural to them.”

“The last step is: **5) Check**, which involves monitoring your behaviour. This is the final step and it is important in order to finish the task. When you create a goal, you create a discrepancy between the state that you are currently in and the state where you want to be. This stage involves the comparison of the outcome of your actions and the state that you are currently in with the desired goal state. If there is a mismatch between the two, you will have to go back to step 1 and repeat each step until there is no more discrepancy between the two. This is basically a feedback loop from Monitoring to Orienting-Alerting. You can repeat this cycle as many times as necessary and make adjustments when necessary.

Which of the steps that I have discussed before would you think may be helpful in monitoring one's behaviour?” *(The researcher asks for step 1, but if other answers are given, those are discussed as well).*

Students are encouraged to share a life experience when they went off-task.

“Can you think of an experience where this has happened, where you perhaps set a goal but failed to monitor it and thus went off task?”

Students' answers are discussed and the stages that perhaps would have been helpful in those situations.

“Those were the 5 steps of GMT. Which one would you say was the most helpful one to you personally? Would you use it in real life? Do you have any other comments about the approach?”

“Now we will do the timed tasks again. I encourage you to use any of the steps or strategies that I just showed to you.”

APPENDIX H

Goal Management Training - Handout

The Five Stages of Goal-Management

1) STOP!

→ Orienting and alerting to tasks.

Notes:_____

2) Define the main task

→ Goal setting

Notes:_____

3) List steps

→ Partitioning goals into subgoals

Notes:_____

4) Learn steps

→ Encoding and retention of subgoals

Notes:_____

5) Check

→ Monitoring

Notes:_____

APPENDIX I
Qualitative Feedback Questionnaire

Please answer the following question by circling the number that best describes your experience.

	5	4	3	2	1
	Completely agree	Agree	Somewhat agree	Disagree	Completely disagree
1) This was a useful exercise.				5	4 3 2 1
2) I feel that this exercise increased my strategic thinking abilities.				5	4 3 2 1
3) I feel more confident in my strategic thinking abilities.				5	4 3 2 1
4) I believe that I will forget fewer things in my life.				5	4 3 2 1
5) I will continue using the skills I have learned in my everyday life.				5	4 3 2 1

6) Name the specific components that made you rate this exercise the way you did:

7) Things I liked about this exercise (please be specific):

8) Things I did not like about this exercise (please be specific):

APPENDIX J

Picture Recognition Task

Please indicate whether the pictures are identical to the ones you have previously seen and how certain you are of this decision.

- | | | | | |
|----------------|--------------------------|-----|--------------------------|----|
| 1) Identical? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Certainty: | 0 | 1 | 2 | 3 |
| | | | | |
| 2) Identical? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Certainty: | 0 | 1 | 2 | 3 |
| | | | | |
| 3) Identical? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Certainty: | 0 | 1 | 2 | 3 |
| | | | | |
| 4) Identical? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Certainty: | 0 | 1 | 2 | 3 |
| | | | | |
| 5) Identical? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Certainty: | 0 | 1 | 2 | 3 |
| | | | | |
| 6) Identical? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Certainty: | 0 | 1 | 2 | 3 |
| | | | | |
| 7) Identical? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Certainty: | 0 | 1 | 2 | 3 |
| | | | | |
| 8) Identical? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Certainty: | 0 | 1 | 2 | 3 |
| | | | | |
| 9) Identical? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Certainty: | 0 | 1 | 2 | 3 |
| | | | | |
| 10) Identical? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Certainty: | 0 | 1 | 2 | 3 |
| | | | | |
| 11) Identical? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Certainty: | 0 | 1 | 2 | 3 |
| | | | | |
| 12) Identical? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Certainty: | 0 | 1 | 2 | 3 |

Please circle:

0 = not certain at all

1 = somewhat certain

2 = certain

3 = absolutely certain

APPENDIX K
Word Recall Task

Recall Sheet

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____
- 8) _____
- 9) _____
- 10) _____
- 11) _____
- 12) _____
- 13) _____
- 14) _____
- 15) _____
- 16) _____
- 17) _____
- 18) _____

APPENDIX L

Word Recognition Task

Word Recognition Form

Please circle:

OLD = you have seen the item on any of the previous lists
NEW = you have not seen the item on any of the previous lists

Please circle:

0 = not certain at all
1 = somewhat certain
2 = certain
3 = absolutely

- | | | | | | | | | |
|---------------------|-----|----|-----|-----|---|---|---|---|
| 1) <u>Dream:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 2) <u>Sheet:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 3) <u>Bank:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 4) <u>Dark:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 5) <u>Bed:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 6) <u>Swim:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 7) <u>Sleep:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 8) <u>Table:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 9) <u>Breeze:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 10) <u>Floor:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 11) <u>Back:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 12) <u>Couch:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 13) <u>Citrus:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 14) <u>Chair:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 15) <u>Sugar:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 16) <u>Sixteen:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 17) <u>Fright:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 18) <u>Low:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 19) <u>Sour:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 20) <u>Crime:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |
| 21) <u>Sweet:</u> | OLD | or | NEW | and | 0 | 1 | 2 | 3 |

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