STRESS-REDUCING BRAIN EXERCISES: A PSYCHOEDUCATIONAL WORKSHOP FOR FIRST-YEAR POSTSECONDARY STUDENTS

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B.A. (Psychology), University of Lethbridge, 2008

A Project
Submitted to the School of Graduate Studies
of the University of Lethbridge
in Partial Fulfillment of the
Requirements for the Degree

**MASTER OF EDUCATION
(COUNSELLING PSYCHOLOGY)**

FACULTY OF EDUCATION
LETHBRIDGE, ALBERTA

April 20, 2012

Dedication

I would like to dedicate this work to my family who supported and sacrificed to make this project possible:

To my beautiful wife, Shannon, for your remarkable example of resilience and for your self-sacrifice that enabled me to complete this project.

To my children, Autumn and Caleb, who have made similar sacrifices. May you develop the same sort of resilience.

To my parents, Gord and Pat, for your life-long guidance and for the inspiration to make the choices that led me to attend university and complete this project; once a parent, always a parent.

To my brothers and sisters (and in-laws) for providing your own unique brand of support, whether it was expressing interest in my studies, helping Shannon with our children, providing meals when I forgot to eat, and even making fun of my ideas and research interests. Your support kept me motivated and helped me to persevere.

Abstract

The intent of the following project is to highlight information about the stress response, resilience, and executive function development and to apply it to first-year postsecondary student populations in a workshop format. The first part of the project presents three comprehensive literature reviews of academic research available on these subjects. The second part offers a workshop guide broken down into four detailed lesson plans for potential facilitators to carry out four 50-minute workshops. These workshops are intended to be psychoeducational and address the information presented in the report. The workshops may be presented individually or as a series to enable appropriate application to students. The focus of this project is to address the significance of the unique stressors experienced by first-year students with the aim of promoting resilience by developing executive function abilities. The proposed workshop may be instrumental in assisting students to develop these abilities, which may reduce student attrition rates and assist students in accomplishing goals and responding resiliently to stress during their postsecondary education and throughout their lives.

Acknowledgments

First, I would like to acknowledge and express sincerest gratitude to my supervisor, Professor Dawn McBride. Your willingness to accept me as a student, your gentle encouragement and flexibility, and your tireless work and patience made completing this project possible. Your example as an ethical professional inspires me to do likewise.

Second, I would like to thank and acknowledge my committee member, Professor Robbin Gibb. Your engaging teaching style first ignited my interest in psychology and neuroscience.

I would also like to acknowledge Professor Margaret Forgie, Professor Louise Barrett, and Professor Peter Henzie, who first turned my interest toward stress, resilience, and executive functions and opened the door to the possibility of pursuing graduate studies. My life-course has been significantly impacted because of all of you.

Finally, I would like to acknowledge my editor, Shanaya Nelson at Amaya Editing. Your suggestions and attention to detail have enhanced my work. I offer my sincerest gratitude for your assistance.

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Chapter One: Introduction

The intent of this chapter is to provide an introduction to this project. The project is presented in two parts. Part 1 provides reviews of the three core themes of the proposed workshops. The first review focuses on research about the stress response including unique stressors that affect first-year postsecondary student populations, hereafter referred to as first-year students. The second review provides an overview of resilience. The third review discusses research on executive functions, including strategies and tasks that may be used to train executive functions. Part 2 is a workshop guide presenting four workshop lesson plans that may be presented to students independently or in a series (Appendix A). Readers should be aware that Part 1 is intended to provide important details about the information in Part 2, and should be read in order to understand and supplement the material presented in the workshop.

This chapter outlines the projects' rationale, format, and my personal interest as the author of the literature review and the workshop. It also includes a glossary of terms used throughout the project. A hypothetical scenario has also been included for reference and application throughout the review to facilitate understanding.

Project Rationale

This project was developed for three reasons: First, to increase awareness about the significance of the stressors experienced by first-year students; second, to present executive function training as a suitable program for assisting first-year students to respond to stress and increase resilience; and third, to offer a proposed workshop that counsellors in postsecondary institutions may implement with their students. As such, this project has two specific target populations: First, professional college and university

counsellors who might be interested in applying this information for students

transitioning from high school to postsecondary school, and second, students who might

be seeking for information about what to expect from their first year of college or

university and how they might respond to subsequent stress.

Project Format

Part 1 of this project consists of six chapters. Chapter 1 provides an introduction

and overview of the entire project. Chapter 2 details the methods used to collect the

information presented in this project and to create the workshop. Chapter 3 provides a

comprehensive literature review of the stress response as it applies to first-year students.

Chapter 4 contains an overview of the concept of resilience and discusses environmental,

biological, and dispositional factors that contribute to risk or resilience. Chapter 5

provides a review of executive function abilities, including theoretical aspects of

development, purposes, and application to first-year student populations. Finally,

Chapter 6 is a discussion of the strengths, limitations, and areas of future research on

executive function training benefits for responding to stress.

Part 2 of this project is a stand-alone manual located in Appendix A. This manual

is designed to assist facilitators in the presentation of information about the stress

response, resilience, executive function abilities, and executive function training. The

manual includes detailed workshop notes, handouts, and suggested outlines and activities.

Statement of Personal Interest

During my undergraduate degree I studied various topics that influenced my

interest in this project. Studying the effects of maternal stress on fetuses during

pregnancy and the development of executive functions in kindergarten children

contributed to my interest in the relationship between the stress response and executive function training. I was also intrigued by the ability of some individuals to respond to high levels of stress successfully, demonstrating remarkable resilience. I was curious about what enabled these individuals to avoid the detrimental effects of stress. At the same time I was learning about brain plasticity and development. Putting all of this together, I rationalized that people might be able to respond to stress more effectively if they were able to develop and utilize executive function abilities. Following development patterns of executive functions, I considered that providing executive function training for young adults (specifically students transitioning from high school to postsecondary school) might be an appropriate way to apply principles of brain plasticity to make fairly permanent changes to neural circuits and behaviour, thus promoting resilience currently and throughout the lifespan.

Another significant contributor to my interest in this project is my current work experience as a counsellor in a postsecondary school. It has been interesting to observe the high number of students who seek counselling services because of significant issues that impact their lives. Many students report significant levels of stress from academic and social pressures that can threaten to affect the course of their development throughout the lifespan. Students seem to be at a crucial juncture at which several major decisions must be addressed all at once, causing significant stress. I have also observed remarkable potential for resilience. Students seem to be attending postsecondary education because they have specific goals, and often present with high levels of motivation to overcome obstacles. These unique dynamics may create favourable conditions for the development

of executive function abilities that may assist students to overcome challenges and to establish a pattern that may enable them to accomplish current and future goals.

Glossary

This section includes a selection of key terms and definitions that are used throughout this project. These terms include:

Brain Plasticity: Exposure to various experiences, including learning, exposure to environmental factors, or stress can lead to fairly permanent changes in brain structures and functions (Kolb, Gibb, & Robinson, 2003). These changes can occur throughout an individual's lifespan and often result in corresponding changes to behaviour (Nelson, de Haan, & Thomas, 2006).

Executive Function Training: For the purpose of the proposed workshop, executive function training techniques include those tasks and strategies shown to facilitate the development of executive functions.

Executive Functions: This term refers to cognitive functions and processes required for organized, coordinated decision making and behaviour (Jacques & Marcovitch, 2010). These functions make significant contributions to cognitive control and self-regulation (Blair & Ursache, 2011).

First-Year Postsecondary Students: Students who are in their first year of postsecondary education. For the purposes of the project and the workshop these students are young adults transitioning from high school and attending postsecondary school for the first time.

Resilience: This term refers to the ability of individuals to thrive despite exposure to a severe stressor or collection of stressors (Luthar & Cicchetti, 2000; Masten, 2001).

Individuals may demonstrate resilience by maintaining base levels of functioning or by demonstrating swift recovery, adaptation, and sustainability of functioning (Zautra, Hall, & Murray, 2010).

Stress or Stress Response: The biological event resulting in a cascade of hormones for the purpose of making appropriate metabolic changes in order to enhance survival and adaptation (Lovejoy, 2005). In particular, these events are brought about by subjective evaluation of environmental, biological, and psychological cues as threatening. As such, stress is often considered to be subjectively interpreted and individually experienced; individuals may evaluate the same stressor as more or less activating (Lupien, Maheu, Tu, Fiocco, & Schramek, 2007).

Workshop (for this project): The proposed workshop consists of four sessions that may be presented as individual workshops or as a progressive series. This psychoeducational workshop offers students information and techniques that may be used to develop executive function abilities. Students may learn and apply skills and strategies that may be used to respond to and take advantage of the environmental conditions presented by postsecondary education to enhance adaptation and resilience.

A Hypothetical Scenario

To promote the reader's understanding of the material presented, the following hypothetical scenario has been constructed. The student described is fictitious. Any similarities between this student and any other individual are completely coincidental. The situation described is designed to provide an example of what students might experience in their first year of postsecondary studies. This scenario will be frequently

referred to for the purpose of applying concepts discussed throughout the literature review.

Bailey is a recent graduate from high school. She desires to pursue further education to become a dental hygienist. She is the second of five children in a blended family. Her mother works as a supervisor at a fast food restaurant and frequently reports being worried about financial concerns and the care of her children. Her stepfather is an untrained labourer at a local warehouse who is often happy, patient, supportive, and even-tempered. They have limited financial resources to assist Bailey with her goals. Bailey's biological father has been unavailable for many years; he was abusive and aggressive before her mother left him. To help her family Bailey has been required to obtain casual employment and take on family responsibilities, including cooking and looking after her younger sister and half-brothers.

Neither of Bailey's parents nor any of her aunts or uncles has pursued education beyond high school. Although her older brother has attended university, he discontinued his education after the first year. Bailey recognizes that she will need to attend university for many years and the financial difficulty it will pose. She chose to register with a small college that would allow her to transfer after a couple of years. This enabled her to reduce her tuition fees and remain within 100 kilometres of home so she could help with her family on weekends. However, because she lives outside of her family's home she is required to maintain part-time employment in order to afford her living expenses and supplement her student loans.

In addition to inadequate funding and few resources to assist with her transition to postsecondary school, Bailey has test anxiety that interferes with her ability to focus on

what she is reading and will reread questions and instructions repeatedly. She tends to perform poorly on multiple-choice exams. She also has a persistent fear of embarrassment in social situations. She becomes easily frustrated and angry during these instances and becomes verbally aggressive. Due to her social anxiety Bailey has difficulty making friends and spends much of her time alone. However, she has developed some social supports. She has two close friends from her childhood and she has established a romantic relationship that she is highly invested in. In addition, she and her family have frequently attended and participated in a local church, enabling her to make some more friends and providing her with a belief system focused on positive outcomes from hard work. Bailey also enjoys participating in extracurricular activities, including singing, dancing, and playing volleyball and basketball. A few of her classmates have chosen to attend the same school she applied to. She and her boyfriend hope to maintain their relationship despite his enrolment in a university across the country. Before even beginning her postsecondary experience Bailey has many challenges and protective factors that will influence her ability to accomplish her goals.

Summary

This chapter explained the purpose and layout of this project. It described the two parts of this project (the information report in Part 1 and the workshop in Part 2, found in Appendix A). Readers should have an understanding of the intent of the project and the basic key terms used throughout the project. In addition, a hypothetical situation of a fictitious student was presented to augment the reader's understanding and provide appropriate application of the specific concepts discussed.

Conclusion

The purpose of this project is to provide information about material covered in the workshop. Potential facilitators will be able to obtain useful information about how the workshop might be conducted. Chapter 2 details the research methods used to collect the information presented in the literature reviews. Chapter 3 presents a thorough review of the stress response and some experiences that first-year postsecondary students might expect. Chapter 4 provides an overview of the construct of resilience and factors contributing to risk or resilience. Chapter 5 explains some executive functions and their importance in daily functioning and decision making. It also discusses some research about executive function training and its possible effects. Part 1 concludes with Chapter 6, a discussion of the strengths, limitations, and possible areas of future research. Finally, Part 2 of this project contains the workshop manual with suggested lesson plans for each session (Appendix A).

Chapter Two: Methods

This chapter describes the research process implemented to gather information to corroborate this project and to construct the workshop guide (Appendix A). Research focused on a variety of subjects, including the stress response, the transition from high school to postsecondary school, the transition from adolescence to young adulthood, the experience of special populations of postsecondary students (e.g., first-generation and minority students), resilience, risk and protective factors, brain plasticity, executive function development, and executive function training activities. A list of search terms and search engines used is discussed. Finally, this chapter outlines the ethical position adhered to in developing this project.

Research Focus

Many of the topics discussed throughout the project have an extensive historical background. Therefore, as the author, I was open to sources that founded key terms (e.g., fight or flight) and dated back as far as 1963. Research dated before 2000 has been included because of this reason or because the selected documents made significant contributions to the subjects discussed. Although studies range in age from 1963 to 2012, the majority of the studies occur between 2000 and 2012.

As the author, I gathered information from many types of sources, including primary sources such as research articles, and secondary sources such as review articles and books. Review articles and books enabled me to quickly consolidate findings into a comprehensive arrangement. Research articles enabled me to include empirical evidence from specific studies, thereby strengthening explanations. For example, studies that

establish transfer of gains made from executive function training to broader situations increase the validity of executive function training for responding to stress.

Studies varied in geographic location. Most of the studies were conducted in the United States of America by American authors. There were also a number of studies conducted in Europe and Canada. The majority of these studies were quantitative to establish correlations and links between variables. A few of the studies were qualitative, adding depth and subjectivity to the research.

Research Process

The literature review was compiled by conducting searches through various databases. Search terms included but were not limited to: stress, the stress response, cortisol, sympathetic/parasympathetic response, effects of stress/cortisol, academic stress, transitional stress, adolescent stress, young adults, college freshmen, first-generation students, resilience, risk/protective factors, perceived control, brain plasticity, executive function, working memory, response inhibition, set-shifting, cognitive flexibility, self-regulation, transfer effects, and executive function development/training. The following databases were used to conduct these searches: PsycINFO (via Ovid), ScienceDirect, Academic Search Complete, JSTOR, PsychiatryOnline, and Sage Journals Online. Google Scholar was also used to obtain additional research articles.

Ethical Stance

The project did not require the use of human research participants in the collection of data. As such, approval from the University of Lethbridge ethics committee with regard to the use of human subjects was not required. As the author, I adhered to the *Canadian Code of Ethics for Psychologists* (Canadian Psychological Association, 2000).

I also adhered to the writing and publication requirements outlined in the 6th edition of the *Publication Manual of the American Psychological Association* (American Psychological Association, 2010). Creative expression was reserved for the workshop guide (Appendix A); however, editorial standards were still followed.

Summary

This chapter focused on the research methods used throughout this project. The research focus and process was discussed, including a list of key search terms and databases used. In addition, my ethical standpoint was stated.

Chapter 3 comprises a literature review of stress. An explanation of the stress response will be presented, including its effects on the body and the brain. In addition, the unique challenges experienced by first-year students will be explored. The effects of stress on this population will be explored in greater detail, including its effects on academic performance and student attrition rates. Specific attention will be given to unique stressors experienced by first-generation and cultural minority students.

Chapter Three: The Stress Response

Stress, as experienced by postsecondary students, is the primary focus of the proposed workshop (Appendix A). As a universal experience, stress is a significant factor in determining the developmental trajectory of students (Selye, 1978). The negative effects of stress contribute to the development of psychopathology and student dropout rates (de Kloet, Joels, & Holsboer, 2005; Ishitani, 2003, 2006). This chapter is written for postsecondary counselling departments, specifically for potential facilitators of the stress management workshop developed for this project. The examples used in this report reflect the experiences of postsecondary students to provide appropriate application of the information discussed.

This chapter provides a basic definition of stress and an explanation of the stress response, including the organs and the brain structures that are activated, and the hormones that are released. This chapter also discusses the positive and negative effects that the stress response has on the body and the brain. The information presented in this chapter is intended to ground workshop participants in a solid understanding of what occurs in their bodies as they experience stress, and why it may be important to respond to stress appropriately.

Particular attention is devoted to the unique transition that young adults experience after completing high school and begin postsecondary education. Some of the unique stressors experienced by postsecondary students are discussed, and the potential effects of such stressors are explored. In addition, specific populations of first-year students are highlighted. These include first generation postsecondary students and

students who identify with an ethnic minority group. Finally, the implications of the

effects of stress on the retention rates of first-year students are discussed.

Stress and the Stress Response

Stress is a confusing concept with many definitions that can lead to conflicting

interpretations. As applied to humans, it may be loosely defined as any stimulus that

creates a deviation from normal functioning (Lovejoy, 2005). Selye (1978), who is often

referred to as the father of stress, noted the stress response is designed to bring about

adaptation to change. Humans seem programmed for adaptation to novel or unexpected

events (Selye, 1978). On a daily basis the human body will make frequent changes in

heart rate, blood pressure, and body temperature in an effort to respond to such events

(Sterling, 2004). In this sense, some effects of the stress response may be initiated by

even the simplest of stimuli, such as attempting to focus attention while sitting in a

classroom and trying to meet new people. However, stress is more often used to describe

more extreme threats to safety or personal balance, such as in serious illness, the death of

a loved one, managing deadlines for assignments and projects, taking tests, and giving

public presentations. Selye (1978) referred to this type of stress as "distress" (p. 74).

Distress is the focus of the workshop designed for this project (Appendix A). It occurs

when the demands placed on individuals become greater than their capacity to adapt

(Selye, 1978). Following the hypothetical example explained in Chapter 1, Bailey may

believe that she can manage the same number of challenging classes in university that she

was able to maintain in high school. Postsecondary courses likely have different, more

challenging requirements that may cause significant strain on her resources, resulting in

fatigue, illness, and reduced motivation (Lindau, Almkvist, & Mohammed, 2010). Her

grades will likely suffer and she may decide to skip or drop classes or semesters, abandon her goals, or drop out of school altogether (Hey, Calderon, & Seabert, 2003).

Stressors may be environmental (e.g., assignments and tests), biological (e.g., illness), or psychological (i.e., subject to personal interpretation). Peoples' cognitive evaluations of what is threatening have a significant effect on the stress response (McEwen, 2000; Pruessner, Wuethrich, & Baldwin, 2010). This means individuals may perceive the same stressor as either threatening or nonthreatening. For example, one student may be terrified of giving a presentation because of a fear of public speaking, while another remains unaffected. Although many stressors exist that elicit the same response in most individuals (e.g., threats to personal safety), in westernized cultures the majority of people most often experience stress because of relative stressors (e.g., test anxiety) that are dependent on subjective interpretation (Lupien et al., 2007). However, it is interesting to note that the same biochemical stress response will occur to varying degrees whether a stressor is great or small, threatening or nonthreatening, real or perceived (Lupien et al., 2007; Selye, 1978).

During stressful situations, the body undergoes a series of changes to enable adaptation, called the stress response. The human stress response results in a cascade of hormones that interact with the brain and other organs in an effort to facilitate self-preservation and to reestablish balance and enable adaptation (Lovejoy, 2005). This response is often referred to as the fight or flight response (Cannon, 1963). However, people have also been known to freeze or faint in response to an acute threat (Bracha, 2004).

An important distinction must be made between stress and arousal. Payne et al. (2006) explained that stress results in instant activation of three major hormonal structures that make up the hypothalamic-pituitary-adrenocortical (HPA) axis, ultimately resulting in the release of cortisol in an effort to restore balance. Although arousal may have similar effects as stress (e.g., increased heart rate), it differs from the stress response in that it does not activate the HPA axis or stimulate the release of cortisol (Payne et al., 2006).

Bailey's social anxiety may provide an appropriate example of the stress response. She has been anticipating a presentation worth 30% of her final grade. Due to the many competing demands for her time she has been unable to adequately prepare for this presentation with her group members. Her worries about appearing foolish in front of her peers and her fears about achieving a poor grade have resulted in frequent activation of her stress response. These are her first thoughts on the morning of her presentation. Her stress response is immediately activated. First, a structure in the middle of her brain, called the hypothalamus, secretes corticotropin-releasing hormone (CRH). The hypothalamus is part of the autonomic nervous system and is responsible for homeostatic processes such as breathing, heart rate, and regulation of body temperature (Lovallo & Sollers, 2010). Second, the pituitary gland, which is located near the hypothalamus, is stimulated by CRH to release adrenocorticotropic hormone into the blood (Gunnar & Quevedo, 2007). Once in the blood, adrenocorticotropic hormone has one function: to travel to the adrenal gland located on the kidneys and stimulate the release of epinephrine, norepinephrine, and glucocorticoids (cortisol in humans) into the blood (Lovejoy, 2005).

The epinephrine and norepinephrine immediately interacts with Bailey's body to regulate cardiac output, oxygenation, and constriction or dilation of blood vessels in response to demands placed on relevant systems (e.g., major muscle groups; see Berg & Pickering, 2011, for a review of cardiovascular responses). In this way blood flow is diverted away from organs that are not immediately associated with survival (e.g., digestion and sexual arousal) and redirected toward organs that are essential for survival (e.g., immunity and immediate dispersal of energy; Lovejoy, 2005). For example, Bailey might experience an increase in heart rate, quickened breathing, reduced blood flow to her extremities (e.g., her hands and feet may become cold), and her appetite may be suppressed. These changes in the body correspond with similar changes in the blood flow to the brain. A reduction in blood flow has been observed in the prefrontal cortex, which is associated with cognitive tasks such as planning and problem solving, in response to exposure to perceived stressors (Ahs et al., 2006; Tillfors et al., 2001). At the same time, an increase of blood flow has been observed in the hypothalamus and the limbic system (hippocampus and amygdala), associated with fear and emotional arousal (Ahs et al., 2006; Tillfors et al., 2001). These changes in blood flow indicate increased neural activation in these brain regions and may influence behaviour. For example, Bailey may be unable to concentrate on the information in her presentation and may have difficulty explaining her part. If an unforeseen circumstance arises, such as technical difficulties, Bailey may experience difficulty in fixing them. However, Bailey's copresenters may not perceive public speaking as threatening, and are, therefore, likely to maintain regular blood flow, resulting in their cognitive abilities remaining unaffected

(Tillfors et al., 2001). It should be noted that these responses occur to varying degrees whether the threat is real or perceived (McEwen, 2000).

Cortisol begins to interact with the body approximately 20 minutes after secretion into the blood (Lovejoy, 2005). This has several effects on the body and brain, including metabolizing carbohydrates and fats for energy release, reduction of inflammation, inhibition of the immune response, and facilitation of learning and memory (Pearson-Murphy, 2010). Bailey will likely learn from her experience and take steps to prepare herself for future technical problems. Elevated cortisol levels also act as a signal to the hypothalamus to reduce the amount of CRH released, thus suppressing the stress response and enabling the restoration of homeostasis (Gunnar & Quevedo, 2007). Cortisol reaches peak levels 15–30 minutes after exposure to a threat, and these elevated levels of cortisol enable the brain to initiate recovery from the threat, which may take an additional 60–90 minutes (de Kloet et al., 2005). It is important to note that cortisol is an integral part of the body; it is required for metabolic functions and is typically present in the blood at moderate levels (Pearson-Murphy, 2010). However, if it is present in excessive amounts or for prolonged periods of time (e.g., during a traumatic event or an inescapable stressor), cortisol and other hormones released during the stress response can have lasting detrimental effects on the body and the brain, which is discussed below (de Kloet et al., 2005).

The stress response reactions just described constitute some of the actions automatically taken by the sympathetic branch of the autonomic nervous system (Lovejoy, 2005). When an individual perceives that the threat is gone, or the individual feels safe, the HPA axis is inhibited resulting in termination of the stress response

(Kollack-Walker, Day, & Akil, 2010). For example, after the presentation is over

Bailey's body begins to relax and recover. Her stress hormone levels are reduced, heart

rate returns to base levels, and blood flow is returned to digestive and reproductive

organs in a process called rest and digest (Cannon, 1963). The effects of the stress

response diminish. This process is mediated by the parasympathetic branch of the

autonomic nervous system and is carried out largely by stimulation of the vagus nerve,

which has been found to increase learning, memory consolidation and retention,

creativity and cognitive flexibility, and facilitate appropriate decision making (Ghacibeh,

Shenker, Shenal, Uthman, & Heilman, 2006a, 2006b; Martin, Denburg, Tranel, Granner,

& Bechara, 2004). It is likely that both sympathetic and parasympathetic processes are

necessary for successful adaptation to occur (Porges, 2010). It is important to note that,

although less detail is given to explaining the parasympathetic effects of the stress

response, the aim of the workshop is to enable individuals to reduce the negative effects

of the stress response by facilitating the transfer into parasympathetic processes sooner.

See Figure 1 for a summary of the effects of the sympathetic and parasympathetic
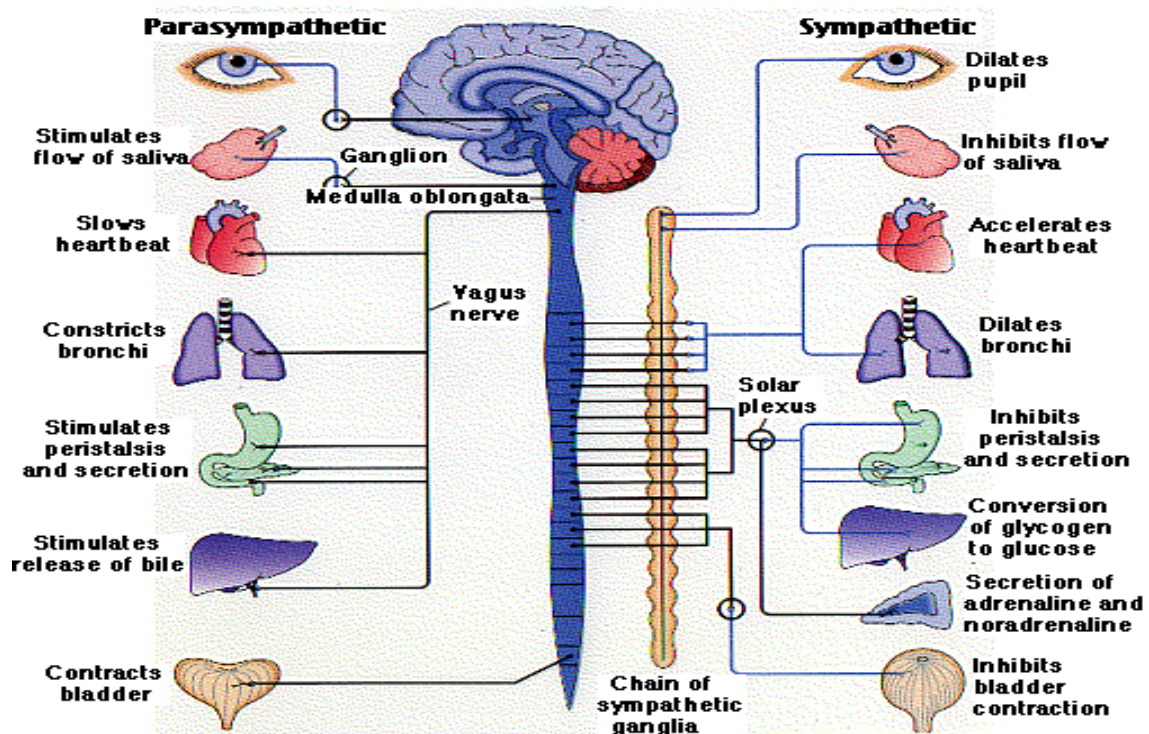
nervous systems.

Figure 1. Effects of the sympathetic and parasympathetic nervous systems on the body.

Note. From *Organization of the Nervous System* (para. 4), by J. Kimball, 1994, retrieved from http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/P/PNS.html. Copyright 1994 by J. Kimball. Reprinted with permission (personal communication, April 14, 2012).

Physical and Cognitive Effects of the Stress Response

Generally, the stress response is beneficial, enabling learning, adaptation, and ultimately survival (Lovejoy, 2005). Buckingham (2010) summarized the positive effects of cortisol that may occur when the stress response is relatively brief and cortisol levels are moderate. These include increased protection from inflammation, increased conversion of energy stores to usable forms, and improved cognitive abilities (e.g., learning, memory consolidation, and recall; Andreano & Cahill, 2006; Wolf, 2008). The learning process itself may be enough to initiate a stress response that has such benefits (Selye, 1978). However, there are also costs to adaptation (McEwen, 2000).

Negative effects of prolonged exposure to cortisol. The severity of costs to adaptation to stress varies according to the length of time the stress response is activated for (i.e., chronic stress) and its intensity. Chronic exposure to cortisol is implicated in infertility, digestive and circulatory problems, inhibited skeletal growth, and the development of osteoporosis (Buckingham, 2010; Lovejoy, 2005; Pearson-Murphy, 2010; Willenberg, Bornstein, & Chrousos, 2010). Bailey and other postsecondary students more likely experience slower healing of surface wounds, obesity, depressed mood, psychosis, diminished libido, disruptions in sleep patterns, suppression of the immune system, and greater vulnerability for developing ulcers (Buckingham, 2010; Vgontzas, Pejovic, & Karataraki, 2010). Chronic stress can also trigger or aggravate asthma and dermatological conditions, such as rosacea, psoriasis, eczema, acne, and alopecia areata (Gupta, 2010; Kaptein, 2010).

The effects of cortisol on the human brain have been widely researched. The brain is the centre for learning, memory, cognition, perception, and ultimately behaviour (for an informative review see Kolb & Whishaw, 2006). Cortisol also affects many other functions that are devoted to the present, including working memory and decision making (Starcke, Wolf, Markowitsch, & Brand, 2008). The stress response may have an effect on any of these functions by interacting with the structures of the brain responsible for them. As mentioned above, the process of learning involves a moderate stress response (Selye, 1978). Moderate levels of cortisol may be necessary to facilitate learning and memory (Oitzl, Champagne, van der Veen, & de Kloet, 2010). Such conditions may have assisted individuals to apply past events to current experiences, enabling adaptation and survivability. Joels, Pu, Wiegert, Oitzl, and Krugers (2006) similarly noted

facilitative effects of moderate levels of cortisol for memory consolidation and learning. However, extended or intense activation of the stress response can have detrimental consequences. When cortisol levels are too high or too low, decreased abilities to consolidate and remember information may be observed (Andreano & Cahill, 2006). Elzinga, Bakker, and Bremner (2005) similarly report that chronic stress can lead to lasting memory impairments.

According to Elzinga et al. (2005) there are three stages in the process of memory: acquisition, consolidation, and retrieval. To test the effect of stress experienced during memory processes, Elzinga et al. directed participants to complete a series of tasks including learning a series of words, repeating lists of numbers in reverse order, and reading paragraphs. Participants were then asked to complete complex subtraction equations mentally in a limited amount of time. These participants were given negative feedback regarding incorrect answers, thus increasing their subjective levels of distress. After the challenge, participants were exposed to more neutral and emotional words. Afterwards they were asked to complete a recall task about the information they were exposed to prior to completing the challenge. The next day participants were asked to complete the tasks again. However, they were exposed to more words intermixed with the words presented before and after the challenge. They were then asked to rate how confident they were about whether they had first seen the word in the list of words presented before the challenge. The experimenters also measured salivary cortisol levels throughout the experiment to determine the effects of cortisol on acquisition, consolidation, and recall (Elzinga et al., 2005).

Acquisition. Elzinga et al. (2005) reported that participants who were required to learn information during or after peak levels of cortisol (after stress) were less successful at recalling that information the next day. This indicates that cortisol may interfere with acquisition. This research is supported by other findings indicating that stress experienced prior to acquisition can interfere with learning (Joels et al., 2006). Furthermore, Payne et al. (2006) observed that although stress seems to disrupt memory processes involving neutral material, it seems to facilitate memory for emotional material. In other words, stressed individuals may be subconsciously attending to the emotional information more than neutral information. Applying this information to students, these findings indicate that students exposed to acute or chronic stress may experience poor acquisition and consolidation of information related to school subjects, but may be better able to recall information related to their negative affect. In support of this, Steinhauser, Maier, and Hubner (2007) reported that stress might lead to a reconfiguration of attention and resources to accommodate increased demand relating to the threat. It seems to be a natural response for individuals to shift attention and energy to behaviours that would facilitate adaptation. Therefore, stress may interfere with learning by causing individuals to shift attention to more relevant and immediate demands, impairing the ability to refocus attention back to more neutral information (e.g., school subjects).

Consolidation. Observations regarding reduced ability to recall information after a 24-hour delay indicated cortisol-mediated impairments in long-term memory consolidation (Elzinga et al., 2005). In another study, Andreano and Cahill (2006) asked participants to read a story and subsequently insert their left hands in either ice water or

warm water for 15 minutes or until the participant could no longer tolerate the exposure.

Salivary cortisol levels were obtained at the beginning and the end of the stimulation.

Participants who were exposed to the cold water predictably demonstrated higher cortisol

levels than those subjected to warm-water controls. The stressed participants were

observed to perform more poorly on recall of story items (Andreano & Cahill, 2006).

This indicates that high cortisol levels may interfere with consolidation of information,

perhaps due to distractibility (Andreano & Cahill, 2006).

   Retrieval. It may be likely that the process for memory development proposed by

Elzinga et al. (2005) is progressive. If so, the effects of stress on acquisition and

consolidation will likewise affect retrieval of information. However, it may also be likely

that stress experienced after acquisition and consolidation affects retrieval. For example,

Wolf et al. (2001) observed impaired ability to recall information in individuals who

experienced stress immediately before retrieval. Young and elderly adult participants

were asked to learn a shopping list and subsequently administered hydrocortisone, a

cortisol substitute. Fifteen minutes after administration, elevated cortisol levels were

observed. Participants were then asked to recall the list after a brief delay and after a

long delay. The experimenters observed reduced recall of words learned prior to

hydrocortisone administration. It seems likely that to some degree stress impairs recall of

information whether it is stored in working memory for immediate manipulation or for

use after a brief delay or whether it is stored in long-term memory for recall after

extended periods of time (Joels et al., 2006).

   The timing of exposure to stress and the subjective perception of stress seem to be

critical factors. It is interesting to note that information acquired before stress seems to

remain unaffected by higher cortisol levels (Elzinga et al., 2005). In this way it might be more beneficial for students to engage in ongoing study, rather than to attempt to absorb information the night before an exam. Information reviewed when individuals are calm may be more likely to transfer to long-term memory. Elzinga et al. (2005) reported that recall of this information after 24 hours did not demonstrate the same impairments as long-term recall of information acquired after stress. More detrimental effects of stress seem to be observed if learning is attempted after exposure to stress (Elzinga et al., 2005). However, learning that occurs prior to stress may also demonstrate detrimental effects if the stress is perceived by individuals as more intolerable (Andreano & Cahill, 2006).

To apply this information more directly to students, assume Bailey has a major exam to study for and her boyfriend suddenly and unexpectedly breaks up with her. These two compounding stressors may reduce her ability to shift her attention from the emotional stimuli associated with the loss of her relationship to the learning tasks associated with studying for her exam. If Bailey perceives the break-up as particularly distressing, she is likely to experience strong emotions. Information not immediately associated with the emotions (e.g., schoolwork) will likely be evaluated by her as less significant and may be suppressed, resulting in reduced attention to such neutral information (Oitzl et al., 2010). Consequently, there may be enhanced consolidation of emotional information surrounding the break up and reduced acquisition and consolidation of learned course material (Elzinga et al., 2005; Payne et al., 2006). Furthermore, Bailey's affect about the relationship may exacerbate her test anxiety making it more difficult to concentrate on the emotionally neutral information on the exam. The likely impairment of memory retrieval has particular implications for Bailey

and other students who may experience test anxiety. Even without the added emotional

stress caused by the break up of her relationship, Bailey may be likely to experiences

intense anxiety before or during the test that disrupts her ability to accurately recall what

she learned in class (Joels et al., 2006). Therefore it is important for students to

recognize these responses and learn appropriate strategies for interrupting them and

exercising more appropriate responses.

Summary of negative effects of stress. This section of the chapter focused on

some of the negative effects of the stress response on the body and, more specifically, the

brain. During a threat an individual's stress response results in shifting attention to what

is most immediately pertinent for coping and survival. Although this response is

appropriate for adaptation, it may have detrimental effects on academic learning. If the

stress response is chronically activated, cognitive processes such as learning and memory

are likely to suffer (de Kloet et al., 2005). These effects can contribute to lasting

consequences for individuals who are unable to respond appropriately to stress, especially

those who may have a predisposition for developing depression, posttraumatic stress

disorder, or specific phobias (de Kloet et al., 2005; Wolf, 2008).

Postsecondary students experience many stressors that are unique to and abundant

in postsecondary education (Dyson & Renk, 2006). Chronically stressed postsecondary

students may be at greater risk for developing a chronic disorder because of the type and

constancy of stressors they are exposed to. These will be discussed next.

New Postsecondary Students

A significant area addressed in the proposed workshop includes explaining the

effects that the stress response may have on students making the transition from high

school to postsecondary school. It is a major life transition and is associated with many

novel experiences, including new demands for time, new expectations, and new stressors

(Berzonsky & Kuk, 2000). It occurs simultaneously with the transition from adolescence

to adulthood, which is another major life transition (Pals, 1999). There are so many

significant life-altering decisions that need to be made during this stage of life, including

choosing a career path (education and training), selecting a romantic partner, and

deciding whether to start a family (Pals, 1999). These decisions, coupled with exposure

to new experiences and new environments introduce strain that may be especially

challenging for students (Fisher & Hood, 1987). In addition, some student populations

are more vulnerable to these challenges than others, which is explained in the upcoming

section. Ultimately, the stress associated with this transition has significant implications

regarding student retention and program completion; thus, this type of stress is addressed

in this chapter as well as in the proposed workshop.

      Types of stressors. Postsecondary students face many challenges. The stressors

discussed below do not represent an exhaustive list of what might be experienced by

students. Some are general stressors that are likely experienced by most people

navigating the transition from adolescence to adulthood.

      One of the most obvious, and possibly underestimated, challenges during this

transition is homesickness (Beck, Taylor, & Robbins, 2003). Students report a

considerable amount of anxiety about moving away from what is familiar (Dyson &

Renk, 2006). Beck et al. (2003) described homesickness as a type of adjustment disorder

with accompanying depressive symptoms. Homesickness stems from attachment to and

longing for a previously known and comfortable environment and support network,

especially when presented with a novel and unfamiliar environment with limited supports (Beck et al., 2003). Bailey must leave behind the people in her life who have typically provided the most support (i.e., family and friends) and attempt to adapt to her new environment and new challenges without such support. She must develop a new support network by establishing new relationships. Students who are able to achieve this quickly are better able to respond to the new demands of the postsecondary environment (Dyson & Renk, 2006).

Another major challenge experienced by students during the transition to adulthood is identity exploration and consolidation. Identity develops significantly during late adolescence and early adulthood (Pals, 1999). This is a time when people no longer identify with adolescence, but do not yet meet their expectations of what it means to be an adult (Arnett, 2000). Arnett (2000) termed this "emerging adulthood" (p. 469) to reflect some of the important changes that occur as people progress to adulthood. In this stage, individuals are free to experiment with different roles (e.g., career paths), thus constructing their personal identity. As such, there is considerable volatility. According to Arnett (2000), the top three areas requiring individuals' attention, include personal responsibility (e.g., time management and setting personal boundaries and priorities), independent decision making (from choosing classes to developing personal philosophies), and financial independence (e.g., student loans or part-time work). Individuals who extend their interests through exploration and trying new things have a better sense of identity and are better equipped to respond to challenging events (Arnett, 2000). Such individuals demonstrate independence and self-sufficiency and can operate without relying excessively on others (Berzonsky & Kuk, 2000). However, it is

important to recognize the role of culture in how the expectations and requirements of adulthood are determined. Such considerations are important in understanding the types of stressors that may be expected. For example, Watson (2009) explained the expectations placed on some Native American students to maintain their cultural heritage, which can create difficulties for these students in developing identity. Similarly, collectivistic cultures may place high priority on completing responsibilities to family (Phinney & Haas, 2003). Such students may experience conflict in completing these responsibilities in addition to their academic responsibilities. Some of the specific effects of culture on first-year minority students are discussed in greater detail below.

Having recently completed high school, many of Bailey's personal and academic decisions may be affected by the expectations she and her parents have developed about her goals. She may decide that becoming a dental hygienist is not appropriate or realistic for her and begin a new career path, which may result in disappointment and regret and cause her to question her identity. She may also experience uncertainty about relationships and personal life decisions (Arnett, 2000). According to Pals (1999), in order to successfully navigate this stage, Bailey must recognize and take advantage of exploration opportunities, demonstrate perseverance, make appropriate decisions, and develop self-awareness.

A significant aspect of identity consolidation involves social and romantic relationships. Relationships make up a large part of the social support network, one of the most important coping mechanisms for stress (Garrett & Eccles, 2009; Phinney & Haas, 2003). The absence of a strong supportive social network may be detrimental to the attendance of classes and to academic success (Phinney & Haas, 2003). The

attachment patterns established in the home are carried forward into relationships

developed with new friends and romantic partners (Lehnart, Neyer, & Eccles, 2010).

Appropriate romantic relationships have particularly beneficial effects, including security

and reduction of anxiety and depression (Lehnart et al., 2010). Relationships provide

individuals with trusted resources to disclose challenges and frustrations, thus

contributing to successful adaptation to change (Barry, Hudley, Kelly, & Cho, 2009). For

example, due to her social anxiety, Bailey is easily embarrassed in social situations and

may have difficulty adapting to the demands of postsecondary education. Social

interaction itself presents a significant challenge. However, making friends can provide

her with a secure base from which she can approach challenges. By disclosing her fears

about an impending presentation to a friend, she may receive the support needed to

persevere. However, it is important to note that the benefits discussed above may not be

secured by all types of relationship (Lehnart et al., 2010).

Moving away from home connotes an increase in independence and personal

responsibility. Individuals must demonstrate that they are not dependent on parents to

meet social, financial, and residential needs (Vaillant, 2003). For example, during high

school aspects of financial management, such as payments for insurance, utility bills, and

rent or mortgage, were likely completed by parents (Hey et al., 2003). If students did not

have a job, they likely relied on their parents for income. After leaving their home,

students must seek employment, receive a grant or scholarship, or apply for a student

loan in order to cover the costs of living and education (Hey et al., 2003). Presently,

more students are seeking employment, which introduces competition for time, ultimately

adding more stress by increasing fatigue and interfering with academic responsibilities

(Hey et al., 2003). In Bailey's situation, she would not be able to attend university without a loan and without casual employment. Those who obtain loans must regulate their spending in order to ensure that money is available at the end of the school year. In addition, students often must cook, clean, and purchase groceries. These are tasks that were likely completed by parents when the students lived at home. In order to meet these new demands students must accept more responsibility for their own well-being.

In one study 914 first-year students completed a survey about the prevalence, severity, and disclosure of a traumatic event (Smyth, Hockemeyer, Heron, Wonderlich, & Pennebaker, 2008). The reearchers found that more than half of all students surveyed reported exposure to significant individual adversity or trauma prior to their first year of postsecondary education (Smyth et al., 2008). This prior exposure may increase their vulnerability to stress. Such adversity does not need to be particularly traumatic in nature to cause significant distress or harmful effects throughout the lifespan (Smyth et al., 2008). It is my position that preexistent adversity is likely to resurface and present problems during significant life changes, such as during the first year of postsecondary education. Individuals exposed to significant challenges are likely to be affected to varying degrees by subsequent exposure to stress and activation of the stress response. This is important because such individuals may have particular difficulty navigating the transition from high school to postsecondary school, and may benefit from individual counselling or attending a psychoeducational workshop.

In addition to transitioning from adolescence to adulthood, prospective students are required to transition from high school to postsecondary school. This high school to university transition presents extra challenges for students that increase stress levels

beyond what may be experienced by nonstudents because of the need to maintain academic performance (Wilburn & Smith, 2005). Many students constantly worry about achieving grades that meet personal and parental expectations and managing demanding workloads (Agolla & Ongori, 2009). In addition to the challenges explained above students must keep up with textbook readings, be prepared for quizzes and exams, research and write papers, prepare presentations, attend tutorials and labs, and complete practice assignments (Ross, Niebling, & Heckert, 1999). These academic responsibilities may need to be completed to a higher standard than first-year students were accustomed to in high school. These responsibilities also create significant competition and pressure on students' schedules (Ross et al., 1999). Students may experience significant worry and doubt about the program they have chosen and uncertainty about future success in any career that their program might lead to. These unique stressors have implications on the academic performance of new postsecondary students.

Effects of transitional stress on academic performance. One of the primary concerns for postsecondary students is the achievement of desired grades. The negative effects of the stress response explained above may be particularly detrimental to academic performance. For example, Beilock (2008) observed a reduced ability for students to correctly complete complex mathematical equations in relation to increased anxiety (stress). Worries about academic performance compete for working memory available for problem solving and reasoning (Beilock, 2008; Orem, Petrac, & Bedwell, 2008). Persistent worries may also interfere with students' ability to shift attention to current tasks, thus hindering performance (Beilock, 2008; Orem et al., 2008). Students reported having trouble concentrating on the task at hand because of persistent worry

caused by poor academic performance, high workload, insufficient resources to complete assignments, the future (getting a job), other people (high expectations from other students or family), and financial stability (Agolla & Ongori, 2009). For example, Bailey may have four projects and two midterm exams to complete within the next month. While attempting to study for the midterm exams, she will be required to gather resources for her projects and keep up with current class material by completing required readings. In addition to these academic expectations, she must also account for her part-time employment and the recent news of her grandmother's terminal illness. Worries about these demands will reduce her ability to focus on the most immediate tasks and may affect her performance. In addition, attempting to remember more information than her working memory is capable of retaining may contribute to absent-mindedness, which may result in forgetting one or more of her deadlines (Fisher & Hood, 1987).

The effects of stress on academic performance seem to be particularly detrimental to first-year students because so many of the challenges are new. Students may come to believe they are not capable of completing postsecondary school and drop out before they are able to adapt. In the United States, 1 out of 10 first-year students drop out of school in their first year, higher than any other year of enrolment (Ishitani, 2003). Therefore, it may be especially important for such students to develop coping skills for approaching these novel experiences; a topic addressed in the proposed workshop.

Physical and mental health effects on new postsecondary students. The stress response affects the physical and mental health of all people. However, these effects may be particularly visible in students, who experience continuous academic stress combined with the challenges introduced by the transition to adulthood. For example, given the

challenges that Bailey has, she may have difficulty falling asleep or staying asleep. Such

disturbances are the most commonly reported stressors by students (Ross et al., 1999). In

one study, perceived stress was found to be the most significant contributor to sleep

disturbances experienced by students (Lund, Reider, Whiting, & Prichard, 2009). Lund

et al. (2009) conducted a survey of 1,125 students about their quality of sleep. Students

reported restricted sleeping patterns, including persistent irregularity and inconsistency.

Overall, students seemed to fall asleep later and wake up sooner, resulting in less

cumulative hours of sleep. Some students indicated they stayed up all night at least once

in the previous month. Many students who reported poor sleep quality also reported

decreased motivation to complete academic tasks and significantly greater negative affect

(anger, confusion, depression, and tension). Taken together, sleep disturbances may

contribute to reduced class attendance and poorer academic performance (Lund et al.,

2009).

An urban legend often associated with the first year of postsecondary school is the

"freshman fifteen" phenomenon, an idea that freshmen may gain as many as 15 pounds

during their first year away from home (Holm-Denoma, Joiner, Vohs, & Heatherton,

2008). Although it is more accurate to state that freshmen gain approximately five

pounds, such weight gain may be associated with the stress experienced during the first

year (Economos, Hildebrandt, & Hyatt, 2008). This is because students who experience

high levels of stress are more likely to engage in behaviour that contributes to weight

gain, such as drinking alcohol, eating fatty foods more often, and decreasing physical

activity (Economos et al., 2008). The many demands for Bailey's time may prompt her

to eat fast food instead of scheduling time to go grocery shopping and prepare her own

meals, which may contribute to weight gain. Although weight gain is an effect of stress it

may also cause distress, especially for those who are concerned about body image, thus

contributing to existing stress levels.

The stress response is also associated with symptoms of physical illness. Students

demonstrated a susceptibility to colds and influenza (Cohen, Tyrell, & Smith, 1993). In

addition, Fisher and Hood (1987) identified a rise in symptoms of depression, anxiety,

and obsessionality in association with events perceived as stressful, especially

homesickness. A very important consideration related to these findings is a concurrent

decrease in self-esteem and increased suicidal ideation (Wilburn & Smith, 2005).

Students who experience ongoing, unrelenting stress may experience a sense of

hopelessness that increases suicidal ideation. Although the proposed workshop is not

intended to address suicide specifically, the strategies discussed may assist individuals to

reduce the amount of perceived stress, which may decrease suicide risk.

Specific student populations. Some populations of new students might be more

vulnerable to the transition to the postsecondary environment than others. Such students

may not have some of the protective factors that are generally available to students, such

as a supportive social network. They may experience marginalization or have unique

responsibilities that contribute to difficulty in adjusting to the new demands. Some of

these groups are discussed below.

First generation students. Bailey's hypothetical situation is likely common for

many students. She is an example of a first-generation student, a student who is in the

first generation of her family to obtain postsecondary education. Such students may have

particular difficulty with the first year of postsecondary education because they lack

many resources enjoyed by peers (Barry et al., 2009). First-generation students tend to have smaller and weaker social networks available to relate to their experience (Barry et al., 2009). For example, because Bailey's parents and have limited exposure to the postsecondary environment they cannot provide information to her if she has questions, and may not be able to adequately empathize with her unique stressors. According to Ishitani (2003), students of parents who have not attended postsecondary school are more than twice as likely to drop out as students who have at least one parent that attended a postsecondary school. Bailey's older brother may be able to provide limited assistance using his own experiences from the year that he attended, but they may not accurately reflect Bailey's experiences. Students who perceive themselves as needing but not receiving emotional support are more likely to demonstrate less effective coping, report feeling overwhelmed, and experience social isolation and less academic success (Barry et al., 2009). First-generation students are likely to view peer support as more beneficial than family support (Dennis, Phinney, & Chuateco, 2005). Therefore, Bailey must establish a network of friends if she wants to obtain the support she needs. Doing so will increase her resources and assist her in appropriately adjusting to new challenges. Without such resources first-generation students are less likely to complete postsecondary training, and demonstrate greater difficulty in adjusting to and succeeding in school (Ishitani, 2003, 2006).

Cultural minority students. There are some challenges among minority populations that demand greater attention than may be required by the majority of students (Watson, 2009). Combined with first-generation status, minority students have greater likelihood of not completing postsecondary education (Ishitani, 2006). These

challenges seem to centre on feelings of alienation and identity. For example, the

development of personal identity experienced by students during the transition to

adulthood may require a specific focus on racial identity. The degree to which a minority

student identifies with his or her cultural heritage is a significant factor in individual

identity (Watson, 2009). Students who are secure in their racial identity may be more

likely to become involved in academic and extracurricular activities, thus contributing to

adjustment (Watson, 2009). It is interesting to note that neither complete acceptance nor

complete rejection of mainstream culture seems to be associated with success in

academic adjustment. Rather, according to Watson (2009), students who can retain their

cultural identity through affiliation with others who share such similarities while

simultaneously adapting to academic and social demands may demonstrate better

adjustment to postsecondary life. Such students are more likely to complete the

requirements of their program.

Smaller numbers of cultural minority students enrolled in postsecondary school

may reduce the opportunities for affiliation with similar others. In such cases support

from family may become particularly important (Dennis et al., 2005). However, family

support may have costs. Phinney and Haas (2003) noted that minority students are more

likely to carry family responsibilities in addition to academic responsibilities. These

students may be offering more support than they are receiving. Students who do not feel

supported in their academic objectives are more likely to report poor performance and a

lack of perceived control over their circumstances (Phinney & Haas, 2003). In contrast,

too much parental involvement may result in a reduced sense of well-being (LeMoyne &

Buchannan, 2011). Students whose parents are overinvolved during postsecondary years

are likely to experience less individuation and reduced self-determination (LeMoyne & Buchannan, 2011).

More important than factors derived from cultural dynamics are the internal factors that minority students bring with them and aspects of the postsecondary setting (Dennis et al., 2005). Personal interest, curiosity, skills and strategies, motivation, and available programs supporting students (e.g., clubs and family support) may more accurately determine academic outcome. These factors are likely true for all students irrespective of cultural status, indicating that adjustment and academic achievement is ultimately each student's personal responsibility, and family and peer support provide important resources that contribute to success (Dennis et al., 2005).

Implications for student retention. According to Ishitani (2003), student drop-out rates are the highest in the first year of postsecondary study. Although there are many factors that lead to such outcomes, the most significant contributor seems to be related to higher levels of stress associated with unclear expectations arising from the number and the type of novel experiences that occur during the first year of postsecondary school, such as those listed above (e.g., budgeting finances). There are also many risk factors associated with attrition that make coping with novelty more difficult, including being a first-generation student or a minority student, lower high school academic standing, lower socioeconomic status, lower self and family expectations concerning graduation, lower financial aid (Ishitani, 2006). First-year students are less likely to have appropriate coping mechanisms available, such as a supportive social network and knowledge of stress reduction strategies. It is important for students to have the opportunity to develop these resources. Students who become

more academically and socially adjusted during their first year are more likely to complete their programs (Watson, 2009). In addition, students who are given the opportunity to disclose their thoughts and feelings about their experiences tend to make fewer visits to the health centre and have higher grade-point averages (Barry et al., 2009). Taking the opportunity to discuss stressors enables students to receive information about strategies that will assist them in responding to stress and in making appropriate decisions that may reduce student drop-out rates.

Summary

The first year of postsecondary education often presents significant adversity for students making the transition from high school to postsecondary school. This transition challenges students' abilities to adapt and threatens homeostasis. Such homeostatic threats incite the stress response to promote adaptation. However, frequent or intense activation of the stress response can contribute to the development of a chronic condition, such as mood or anxiety disorder (Wolf, 2008). Students must be able to recognize, develop, and access internal resources (e.g., cognitive strategies) and external resources (e.g., social supports) in order to appropriately manage stress levels. Failure to do so could result in poorer academic performance, unachieved goals, or attrition (Ishitani, 2006). These outcomes increase when specific demographic factors are present. For example, resources for first-generation postsecondary students or minority students can be limited in comparison with other students. It is important for these students to develop and practice skills and strategies to enable appropriate coping and adaptation. Doing so may reduce the negative effects of stress and contribute to student retention.

Conclusion

There are sufficient challenges and individual changes during the ages of 18 to 30 to warrant appropriate development of coping strategies for stressful experiences. The detrimental effects of the stress response can influence the short- and long-term objectives of first-year students. Lehnart et al. (2010) indicated that life experiences influence the amount and direction of change in a "dynamic-transactional" (p. 659) way. Experiences and interactions, whether positive or negative, can influence student outcomes. Given these possible consequences it may be beneficial to encourage more appropriate experiences for students by providing an information workshop regarding resources available, the more common stressors, the effects of stress, and strategies for responding to stress that may be beneficial in aiding student adjustment. This may be particularly useful for first-generation and minority students in their first year of study (Ross et al., 1999). Students could be provided instruction and exercises designed to enable them to anticipate problems, identify ineffective personal strategies, and to practice and use more constructive coping and problem-solving strategies (Berzonsky & Kuk, 2000). Providing such training may enable students to develop resilience, thus influencing their ability to respond to stress for many years to come, which can promote a more positive developmental trajectory.

The following chapter will discuss resilience and its relationship to stress in greater detail. The process of resilience will be explored and specific factors that offer protection or increase risk will be considered. Specifically, personality factors relating to the development of internal supports will be discussed. There is potential for significant

development of internal supports that may foster resilience and promote retention of

students in their first year of study.

Chapter Four: An Overview of Resilience

The previous chapter focused on subjective stress and its general effects on people, specifically students. According to Selye (1978), stress is a universally experienced event. The stress response operates through the same mechanisms and hormones in all individuals. However, the results of stress are often highly variable. In this chapter, I propose that an effective and subjectively beneficial response to stress is one that demonstrates resilience. Resilience research focuses on individuals who appear to be unaffected by stress. These individuals may have experienced a singularly significant threat or life event (e.g., rape or the death of a family member), or an accumulation of factors (e.g., assignments, exams, and presentations) without demonstrating the negative physical and cognitive effects described in the previous chapter, thus demonstrating resilience. Developing the ability to respond to stress in order to enhance resilience is the focus of the workshop.

By facilitating the development of resilience in the presence of a significant challenge or a culmination of stressful factors, students may acquire the ability to respond appropriately to stress during their postsecondary education. This may increase student retention and enable students to accomplish their goals. It may also establish a pattern of resilience for future challenges, such as during the search for work after graduation.

In this chapter, the process and the mechanisms involved in resilience are discussed. Factors contributing to individual risk or to protection are explored. Specific attention is given to personality factors implicated in resilience and subjective control of internal and external resources to enhance resilient outcomes. Finally, the relevance and implications of resilience to postsecondary students are discussed. Examples of

individuals responding adaptively and recovering from significant adversity are common throughout the lifespan (Bonanno, 2004). Therefore, it is likely that resilience may be demonstrated and developed in young adults as they transition from adolescence and high school to the greater independence and challenges representative of adulthood and postsecondary education.

Resilience Defined

Resilience is a complicated construct. Definitions of resilience seem to differ slightly between researchers, leading to confusion and disunity in resilience research (Luthar, Cicchetti, & Becker, 2000). However, there are three common aspects that researchers seem to agree are critical to the definition of resilience (Luthar et al., 2000, Masten, 2001; Zautra et al., 2010). First, there must be exposure to significant adversity. This adversity can occur as one major life event, such as learning a family member has cancer, or as a series of smaller events, such as social isolation, academic stress, homesickness, and life transitions (e.g., from high school to university) that cumulatively present significant challenges to balance (Beck et al., 2010; Hey et al., 2003; McEwen, 2000; Zautra et al., 2010). Masten (2001) further explained that the adversity must have the potential to pose a threat to normal development. Such threats have often been referred to as risk factors that predispose individuals to maladaptive development (Luthar et al., 2000; Masten, 2001). For example, social isolation during the transition to postsecondary school can significantly impact academic success and can affect students' ability to complete postsecondary education (Dennis et al., 2005).

Another common factor in resilience is that individuals must demonstrate successful adaptation (Luthar et al., 2000, Masten, 2001; Zautra et al., 2010). Successful

adaptation may be viewed as the ability to demonstrate persistent functioning or quick and effective recovery from adversity (Ong, Bergeman, Bisconti, & Wallace, 2006). Faster recovery indicates greater resilience (Masten, 2001). Resilience may also be demonstrated when an individual maintains base functioning throughout challenges (Bonanno, 2004). For example, Bailey may demonstrate resilience if she achieves the grades she desires in her classes despite the cumulative effects of her break-up with her boyfriend, her family responsibilities, social anxiety and isolation, financial strain, part-time employment, and her debilitating test anxiety.

The third common qualification for resilience is sustainability of recovery (Zautra et al., 2010). Sustainability may be demonstrated by an individual's capacity to avoid delayed adverse reactions (Bonanno, 2004; Zautra et al., 2010). An example of this can be seen in postsecondary students who maintain a high degree of excitation throughout a difficult fall semester, but then catch a cold or flu when the semester is over, indicating that the stress level may have weakened the immune system (Cohen et al., 1993).

Risk and Protective Factors

Resilience is an active process that incorporates numerous risk factors and protective factors (Luthar et al., 2000). In this line of thinking, resilience may be viewed on a continuum where the absence of risk factors and the presence of protective factors might contribute to resilient outcomes and the opposite may lead to vulnerability. For example, Bailey has many risk and protective factors. These factors are summarized and categorized in Table 1. Risk and protective factors may be classified under three broad categories: environmental factors, biological factors, and dispositional factors, or personality characteristics (Luthar et al., 2000; Lemery-Chalfant, 2010).

Table 1

A Summary of Bailey's Risk and Protective Factors.

	Risk Factors	Protective Factors
Environmental	• Large family.	• Graduated from high school.
	• Low income.	• Social supports (friends, family, church).
	• First-generation postsecondary student.	• Supportive, caring adults.
	• Employment while attending school.	• Involvement in extracurricular activities
	• Termination of a romantic relationship.	
Biological	• Test anxiety and social anxiety.	• Appropriate diet, sleeping habits, and exercise.
Dispositional	• Angry temperament.	• Self-assured and confident.
		• Values hard work.

Environmental factors. An individual's environment is comprised of all aspects that are external to the individual. These might include family as well as social factors such as friends, school, work, and community. The interactions and expectations that arise from relationships with others are also considered environmental factors and have an impact on people's ability to respond to stress (Dennis et al., 2005).

Many factors have been found to increase the degree of risk at the environmental level. Some of these risk factors directly involve the social networks of the community that individuals are raised in and may include poverty, low socioeconomic status,

exposure to neighbourhood violence, exposure and availability of illicit drugs, bullying, social isolation, and lack of social support (Bonanno, 2004; Dennis et al., 2005; Hawkley et al., 2005; Luthar et al., 2000). Some factors, such as poverty, are correlated with many other risk factors and may significantly alter one's developmental trajectory, such as becoming a member of a gang instead of attending school (Masten, 2001). Conversely, reduced poverty, higher socioeconomic status, reduced crime and bullying, social involvement, participation in community sports, and the perception that one is liked constitute protective factors that may increase resilient outcomes (Cicchetti & Rogosch, 2007; Masten, 2001).

The family is also associated with some risks that have important ramifications for individuals. For example, unsupportive parents or partners, parental death or long-term absence, family disharmony, and harsh parental discipline may be some risk factors (Luthar & Cicchetti, 2000; Zimmerman & Brenner, 2010). However, the family can also exert significant protective influences on individuals. Masten (2001) reported that throughout early childhood development parents often attempt to seek appropriate developmental activities for their children, which increases parental involvement and has protective value. Parents who have a high level of education, are involved and supportive, maintain clear boundaries and patterns of communication with their children, and who encourage the development of talents enhance protective influences that foster resilience (Masten et al., 1999; Wong, 2008). Parental support can reduce the effects of homesickness and provide the foundation for appropriate social supports that are so important to students during high school and postsecondary education; however, for postsecondary students support from peers seems to be more influential on adjustment

and academic success (Dennis et al., 2005). If a positive relationship with parents does

not exist, the corresponding risk may be mediated by a warm, continuous positive

relationship with another caring adult (Zimmerman & Brenner, 2010).

Another protective factor that may be considered is the extent to which an

individual subscribes to and actively participates in a religious belief system. Newton

and McIntosh (2010) observed that religious beliefs mediated distress through cognitive

reappraisal, the ability to interpret stressors in different ways and select appropriate

coping strategies. Cognitive reappraisal is effective in reducing negative affect, and may

provide some protection from stress or factors contributing to risk (Troy, Wilhelm,

Shallcross, & Mauss, 2010). In addition, church attendance may provide positive

community influences and increase social support.

As seen in Table 1, Bailey has many environmental risk and protective factors.

Bailey's parents have limited resources to assist her in her postsecondary education, thus

requiring her to work while attending school. In addition, her parents have limited

education, which may prevent them from being as supportive as they might otherwise be.

Bailey's immediate environment may also yield few friends to provide appropriate social

support. These factors contribute to risk of not adapting sufficiently to postsecondary

life. However, her parents may still provide significant support through encouragement

and positive appraisal. She may also have aunts, uncles, or a caring instructor who

provide similar encouragement and acknowledgment of talents, thus providing some

protective factors. In addition, Bailey's participation in church events may enable her to

receive support from church leaders and establish social connections with other students.

Her beliefs may assist her in developing confidence that she can accomplish her goals

and give her a basis upon which to cope with negative events. It may also enable her to reevaluate risk factors or stressors, thus reducing their power.

Biological factors. There are several biological factors that may contribute to students' vulnerability or resilience to stress. Some of these factors include genetics, diet, exercise, and sleep. Genetics influences rather than determines risk or resilience. Much of this is dependent on a complex interplay between genetics, the environment, and personality (Lemery-Chalfant, 2010). For example, the manifestation of heritable characteristics may depend on how offspring choose to interact with events. Depending on experience, perceived stress, interpretation, and learning, environmental exposure can alter gene expression resulting in stable, persistent changes in behaviour (Lemery-Chalfant, 2010). Therefore, risk and protective factors may be developed depending on the type of experiences individuals are exposed to, and the learning and the interpretations that occur (Curtis & Cicchetti, 2003). For example, Bailey's biological father has traits that promote anger and aggression. Bailey may have inherited these traits and subsequently learned to respond more appropriately based on the environmental influences introduced by her stepfather, who may be patient and even-tempered.

Diet, exercise, and sleep have significant biological effects on individuals and differentially affect resilience (Hawkley et al., 2005). Unbalanced diet, too little sleep, and too little exercise can increase risk, whereas a balanced diet, adequate sleep, and moderate exercise are protective (Hawkley et al., 2005). At appropriate levels these factors can have rejuvenating effects on the body and brain. For example, in one study Colcombe and Kramer (2003) observed that cardiovascular exercise increased physical

fitness as well as improved performance on cognitive tasks. Thus, the physical health of individuals may reduce the effects of the stress response and increase resilience.

Dispositional factors. Curtis and Cicchetti (2003) suggested that resilience may be more accurately defined as the "ability" (p. 785) to respond to stress by positively adapting. Describing it this way, resilience seems to be affected by one's disposition (i.e., personality characteristics). It is likely that individual differences in personality account for some variability between people's responses to stressful stimuli. Many of the traits associated with resilience demonstrate polarity, in which the presence or absence of a trait indicates a protective factor, and the opposite demonstrates a risk factor. For example, high levels of extraversion are often associated with more resilience (Vaillant, 2003). Extraverts are more likely to engage with others socially because they tend to find social situations more rewarding (Diener, Suh, Lucas, & Smith, 1999). Thus, extraverts are more likely to experience positive affect from social interaction. Conversely, low levels of extraversion may indicate less resilience because such individuals do not seem to derive as much reward from social interaction, and may not readily develop social supports (Diener et al., 1999).

Another significant personality factor is the level of self-awareness exhibited by individuals. Self-awareness facilitates the development and understanding of one's sense of personal identity (Skodol, 2010; Vaillant, 2003). Recognizing reactive patterns and physiological responses to environmental demands can enable individuals to exert more control, which can contribute to resilience (Skodol, 2010). For example, if Bailey can learn to recognize the physiological effects of anxiety, such as when she is in social situations or completing a test, she can take steps to respond appropriately by learning

strategies, such as deep-breathing to facilitate calmness and relaxation (Davis, Eshelman, & McKay, 2008). Similarly, understanding personal limitations and strengths can encourage individuals to access resources in order to compensate for limitations (Curtis & Cicchetti, 2003). Counselling may assist individuals in developing such understanding.

Additional personality traits that contribute to resilience include a sense of humour, courage, leadership, sociability, an easy-going temperament, self-confidence, emotional control and expression, perseverance, and hope for the future (Luthar & Cicchetti, 2000; Skodol, 2010; Vaillant, 2003; Zautra et al., 2010). These traits serve as protective factors that enable an individual to respond more adaptively to adversity because they encourage optimism, social engagement, and proactive behaviour, such as time management. Although many of these traits (e.g., temperament) likely arise from genetics, they also likely interact with environmental factors by influencing the quality of the experiences to which individuals are exposed (Rothbart & Rueda, 2005). As mentioned above, Bailey may have inherited her biological father's aggressive tendencies and subsequently developed a more easy-going temperament, which may have been modelled by her stepfather. In addition, her perseverance may enable her to access social protective factors, such as friends, instructors, and services, which can promote positive outcomes.

Perceived Control

Perceived control reflects the daily beliefs that individuals have regarding factors that may be manipulated (Diehl & Hay, 2010). It reduces the sense that one is helpless and encourages action (Skodol, 2010). For example, Bailey may recognize that she

cannot control her boyfriend's decision to end their relationship, but she may be able to control the extent to which her emotions are affected by using appropriate strategies. Diehl and Hay (2010) reported perceived personal control may be linked to more reduced reactivity to stress, lower negative affect, increased physical health, and better psychological well being. In contrast, lower levels of perceived control were associated with greater reactivity to daily stressors, increased negative affect, and poorer well-being (Diehl & Hay, 2010). Interestingly, poor perceived personal control seemed to have greater detrimental effects on younger adults than more mature adults (Diehl & Hay, 2010), indicating that training might be beneficial for younger adults.

Perceived personal control may influence the ability to regulate emotions through redirection (e.g., focusing on something else and returning to the emotionally arousing event later) or moderation (e.g., using positive statements to reduce the emotionality of the event), which demonstrates emotional maturity and is associated with more resilient outcomes in the face of adversity (Curtis & Cicchetti, 2003; Davidson, 2000; Ong et al., 2006; Vaillant, 2003). These abilities reflect greater cognitive control, consisting of attention control, internal locus of control, and impulse control, which may be protective (Curtis & Cicchetti, 2003; Luthar & Cicchetti, 2000; Masten et al., 1999). In addition, Curtis and Cicchetti (2003) noted that emotionally mature individuals seem to be able to seek experiences that will be more beneficial (e.g., prioritization and goal setting) and avoid those that will be more harmful (e.g., procrastination). Acting on controllable variables may assist students to alter their experiences and produce more favourable, more resilient outcomes. This has specific application to personal agency and decision making (Vaillant, 2003). Bailey may not be able to choose whether she experiences

anxiety, but she can choose to use strategies to help reduce its effects. When perceived control and decision-making abilities are increased, resilience can also be increased. This section discussed the topic of perceived control, which is also addressed in the workshop found in Appendix A.

Brain Plasticity

Principles of brain plasticity are frequently connected to the concept of resilience and may be useful in promoting and describing changes associated with resilience. Brain plasticity refers to the structural modifications that occur within the brain throughout an individual's life (Kolb et al., 2003). According to Kolb et al. (2003), plastic changes may operate on existing neurons, including increased synaptic development, or may result in development of new circuits. These changes may be brought about by many factors, such as personal experience (including subjective interpretation), drug use, hormones, diet, genetics, disease, stress, brain injury, and cardiovascular exercise (Colcombe & Kramer, 2003; Kolb et al., 2003). It is interesting to note that some factors are substances that interact directly with the brain, such as drugs, hormones, diet, and brain injury, and others occur as events that interact with the brain indirectly through other mechanisms, such as subjective interpretation. The experiences resulting from the way an individual interacts with the environment result in daily changes to the brain, such as learning, memory, addiction, maturation, and recovery (Kolb et al., 2003; Nelson et al., 2006).

Changes to brain structure are related to corresponding changes in behaviour (Kolb et al., 2003). Similarly, people who practice specific skills also demonstrate increased activation in areas of the brain responsible for those behaviours (Nelson et al., 2006). For example, assume Bailey is starting her first semester. Even if she attended a

new student orientation session, she likely has a limited recollection of the layout of the school. She is likely to check maps, room numbers, and building names until she becomes more familiar with landmarks. After some time she may develop more direct routes to classes involving short-cuts. These experiences will promote plastic changes in her brain, leading to corresponding changes in behaviour. The brain is particularly sensitive to the environment during key moments in development, such as in early childhood or in puberty (Kolb et al., 2003). This is explored further in the next chapter, but it is interesting to note that the prefrontal cortex, responsible for decision making and executive functioning, matures into late adolescence and adulthood. This suggests that postsecondary students may be susceptible to plastic changes in these regions and may benefit from cognitive training (Bryck & Fisher, 2012). In addition, Sale, Berardi, and Maffei (2009) observed central aspects of plasticity include novelty and complexity, often referred to as an enriched environment. Postsecondary students are exposed to novelty and complexity on a daily basis. Taking in to consideration developmental stage and the novel environment, postsecondary students may be the ideal population for the proposed workshop.

It is important to recognize that plasticity continues to be an important factor in brain development beyond childhood and adolescence, into adulthood and old age (Bryck & Fisher, 2012; Nelson et al., 2006). Colcombe et al. (2004) observed the effects of cardiovascular exercise on 41 older adults. They conducted functional magnetic resonance imaging before and after the participants engaged in cardiovascular exercise and observed changes in brain activity. The researchers observed increased activation in areas of the brain associated with attentional control (including areas of the prefrontal

cortex). A long-term study was also conducted with similar results (Colcombe et al., 2004). The researchers concluded that cardiovascular exercise is associated with activation in areas of the brain associated with task completion. Colcombe et al. (2004) suggested that such exercise might increase the number of connections between neurons (synapses) in frontal and parietal areas of the brain, enabling greater cognitive load in these areas. This research also suggested that cortical plasticity is not only beneficial for developing children, but for all individuals at any stage of life.

The strength of synapses seems to be determined by their degree of use (Chechik, Meilijson, & Ruppin, 1999). In other words, the more regular behaviours or cognitions are, the stronger the neural pathways and corresponding behaviours become. Similarly, if behaviours or thoughts are reduced, pathways will become weaker or will be eliminated (Chechik et al., 1999). This pattern seems to be indiscriminate, indicating that plastic changes may reinforce either positive or negative behaviours (Bryck & Fisher, 2012). However, this pattern also suggests that it may be possible to reduce or eliminate ineffective or negative responses to stress and foster resilient outcomes by learning and consistently reinforcing more adaptive approaches.

Summary

The previous chapter discussed a topic that forms a significant focus of the proposed workshop – how the stress response is associated with the transition from high school to postsecondary school and the concurrent transition from adolescence to adulthood can present significant challenges to development. The current chapter built on this information by focusing on resilience as a possible outcome of the stress response. It is interesting to observe how some individuals seem to rise out of difficult

circumstances without demonstrating the detrimental effects of the stress response. These individuals seem to adapt quickly and without difficulty. This chapter discussed factors that either reduce the likelihood of or contribute to resilient outcomes. Such risk and protective factors may be environmental, biological, or dispositional. It is important to note that resilience cannot be taught; rather, it can be influenced by manipulating risk and protective factors. One protective factor that may be particularly influential is an individual's sense of perceived control over their experiences. By assisting individuals to recognize factors they can control, they may be able to make choices that influence the speed of recovery from negative stimuli, thus aiding the process of resilience. According to principles of brain plasticity, it may be possible to provide training to postsecondary students to modify how they respond to stress and promote resilience. Kolb et al. (2003) noted that treatments are likely to be more effective if they are able to further reorganize relevant brain circuitry. Such changes in behaviour have been shown to reorganize brain circuitry that has the potential to foster lasting patterns of resilience. It is important to recognize that plastic changes may be adaptive or maladaptive, depending on the experience. For example plastic changes can occur because of patterns of depressive or negative thinking.

Based on the information presented thus far, the proposed workshop is intended to provide an opportunity to increase adaptive patterns (resilience) by training executive function abilities. Such training is thought to promote cortical plasticity (Bryck & Fisher, 2012), which may foster resilient outcomes to adversity, including academic and social stress, and challenges introduced by the independence associated with young adulthood. This is important for first-year students, who are likely experiencing maturational

changes in brain regions associated with executive functions. Plastic changes that occur during this stage may endure into later stages of life.

Conclusion

Students who demonstrate resilience may be more likely to respond appropriately to challenges, which may increase postsecondary success. It seems as though the most appropriate way to facilitate resilience is to limit the number of risk factors, increase the number of protective factors, or to do both. However, that may be an overwhelming task. It may be more appropriate to focus on specific factors, such as those for which individuals perceive they might have control. For instance, at the cognitive level, people can be taught to redirect attention and develop control over impulses (Curtis & Cicchetti, 2003). Although these abilities may be compromised by the stress response, they may still be accessible.

The next chapter focuses on the development of executive functions. Executive functions are performed by the prefrontal cortex, which is still undergoing maturation during late adolescence and early adulthood. Experiences that activate the prefrontal cortex can advance structural changes (i.e., plasticity) that can persist throughout the lifespan. The relationship between specific types of executive functions and decision making in the context of stress will be explored. Specific types of executive function training, and the techniques used in the proposed workshop will also be summarized.

Chapter Five: Executive Functions

This chapter builds upon previous chapters and continues to offer professionals information to utilize when they offer the proposed workshop (Appendix A). Specifically, this chapter addresses executive function abilities that may have an influence on first-year students' responses to perceived stress. Offering opportunities for executive function development may provide students with appropriate experiences that may promote plastic changes in the brain, thus increasing dispositional protective factors that may potentially promote resilient outcomes.

This chapter begins by defining executive function abilities performed by the prefrontal cortex. The development of these executive functions and the ways in which they may reduce the effects of the stress response is summarized. Next, the contributions that they make toward self-regulation are discussed. In addition, the way that executive functions may be activated to promote resilience to challenges is explored. Finally, specific strategies, activities, and training exercises that encourage appropriate executive function development, including those that are relevant to the proposed workshop, are introduced and discussed. Emphasis is placed on the relevance of these techniques to stress management.

Executive Functions Defined

Executive functions may be broadly defined as cognitive functions and processes required for organized, coordinated decision making and behaviour (Jacques & Marcovitch, 2010). These processes are under conscious, focused control and are critical for daily functioning. They are located in the prefrontal cortex and suggest cognitive control of behaviour, including ongoing monitoring and adjustment in order to

accomplish specific tasks or goals (Martel et al., 2007). These regions of the brain are among those most negatively affected by the stress response, yet they are also the regions capable of promoting effective adaptation (Compas, 2006). Executive functions are important for managing responses to novel or unpredictable situations that may cause emotional distress (Stein, 2010). For example, in order to accomplish her goal of acquiring the appropriate education and training to obtain a career as a dental hygienist, Bailey must frequently assess whether her grades are sufficient to meet academic requirements. If her grades do not meet the standards, she must make appropriate adjustments to her daily activities, which might include changing study habits and her social life, or risk abandoning her goal. Her executive function abilities make it possible to maintain the goal in mind, regulate distractions, and make appropriate changes and readjustments to accomplish her goal.

Executive function development. Executive functions begin to develop and influence behaviour during the first year of life (Diamond, 2002). These functions seem to build gradually and consistently throughout childhood, often increasing as children enter adolescence and continuing gradually into young adulthood, resulting in more sophisticated behaviour, such as the ability to predict obstacles to goals (Davidson, Amso, Anderson, & Diamond, 2006). Such growth corresponds to the development of associated areas of the brain, such as the prefrontal cortex, which undergoes extensive and protracted development and maturation, with higher level functions and associated neural networks achieving peak levels in early adulthood (Bryck & Fisher, 2012; Bunge & Wright, 2007; Sowell, Thompson, Holmes, Jernigan, & Toga, 1999). This lengthy period of development may be because earlier executive functions are required to provide

the scaffolding upon which later executive functions are built (Garon, Bryson, & Smith, 2008; Jacques & Marcovitch, 2010). For example, at 4 years of age children are able to hold information in mind and respond to it appropriately (Davidson et al., 2006; Diamond, 2002). However, when they are also required to inhibit a dominant response to the information, they demonstrate poorer performance. It seems that children must be able to manipulate information held in memory before they can develop the ability to inhibit behaviour (Davidson et al., 2006). These abilities continue to develop and become more sophisticated into adulthood.

Developmental periods are complex and may not necessarily be restricted to specific stages or periods (Munakata, Casey, & Diamond, 2004). This indicates that individuals who may have experienced more or less than average development of executive function abilities may continue to make gains throughout their lifespan. However, the most significant gains in executive function development likely occur before such abilities have fully matured. This has important implications for first-year students who are experiencing continued development and maturation of the prefrontal cortex. Executive function training offered during the first year of postsecondary education may be appropriate to make beneficial plastic changes to the prefrontal cortex. For example, as a young adult, Bailey may already possess significantly developed executive function abilities and stress management techniques. However, she may benefit from learning and applying strategies to enhance these abilities because her prefrontal cortex is currently continuing to develop and mature. Learning to utilize these abilities during stressful situations (i.e., when executive functions may be compromised) might be beneficial toward achieving academic goals and life aspirations.

There seems to be conflicting discussion about what abilities qualify as executive functions. Many abilities have been researched and listed as significant contributors to executive functioning, but there are three that seem to be emphasized as foundational. These include working memory, cognitive flexibility, and response inhibition (Davidson et al., 2006; Jacques & Marcovitch, 2010; Miyake, Friedman, Emerson, Witzki, & Howerter, 2000). According to Miyake et al. (2000), these three are important because they are distinguishable, each resulting in separable cognitive functions. They are also highly correlated, often simultaneously interacting to accomplish tasks (Miyake et al., 2000). These executive function abilities, including the way they may operate to respond to stress, are discussed next.

Working memory. Working memory seems to be a fundamental executive function that determines the successful application of many abilities. It is the ability to temporarily store relevant information and maintain it online for direct and often immediate manipulation (Baddeley, 1992). Working memory processes require continuous activation of other executive functions, including updating, monitoring, encoding, control of attention, evaluating incoming information according to relevance, and resisting interference (Miyake et al., 2000; Olesen, Westerberg, & Klingberg, 2004). Working memory also requires discarding older, inaccurate, or irrelevant information. As such, it is important in accomplishing daily activities including simple tasks such as carrying on and understanding conversations, and more cognitively demanding tasks such as learning. It is also associated with processing speed and reasoning skills (Baddeley, 1992). This makes working memory an important ability for all people, and especially important for postsecondary students who are trying to process vast amounts of new

information on a daily basis. Working memory plays an important role in actively

maintaining goals (Miyake et al., 2000), and collecting and coordinating resources to

accomplish these goals (Baddeley, 1992). When working memory is particularly taxed,

other executive functions seems to demonstrate diminished effectiveness (Kincaid &

Trautman, 2010), indicating that developing strategies to increase working memory might

be important for maintaining appropriate cognitive functioning and appropriately

managing daily stressors.

   According to Baddeley (1992), working memory consists of three parts: two

subsystems used to gather and manipulate information and a central executive that directs

attention and applies information gathered to appropriate tasks. The two subsystems are

referred to as the visuospatial sketchpad and the phonological loop. The visuospatial

sketchpad manipulates relevant information gathered by the visual system, which might

include ducking under the branch of a tree or orchestrating the behaviours necessary to

observe notes in a presentation and transfer them to paper by writing. The phonological

loop is responsible for auditory and verbal information, maintaining and storing it by

using silent cognitive subvocalizations (Baddeley, 1992). Such silent self-instructions

may also enable phonological storage of visual material from the visuospatial sketchpad.

This is important because it enables the application of a strategy for increasing working

memory abilities using internal and external verbal instructions (Kray, Eber, &

Lindenberger, 2004). This may assist individuals in managing their responses to stress

and is discussed in detail below.

   The central executive seems to be the command centre. It seems to most closely

correspond to attention processes, consciously and subconsciously focusing on past and

current information gathered by the visuospatial sketchpad and the phonological loop and directing how information should be used (Jacques & Marcovitch, 2010). This requires activating appropriate memory stores, blocking irrelevant information, and regulating reactive and possibly maladaptive responses to the environment.

To illustrate, imagine Bailey is attending one of her classes. According to Baddeley's (1992) model of working memory, as her instructor teaches the class, Bailey's phonological loop will be selecting auditory information about the lecture while her visuospatial sketchpad may be collecting information about the slides. She may also be noticing less important information that might be relevant in other domains, such as the clothes that some of the other girls in her class are wearing, the sounds of whispers behind her, or the sounds of the ventilation system. The central executive must select the most relevant information for her situation and apply it appropriately. Failure to do so could result in her missing important information about her class or assignments. However, storing information about clothing styles may increase her ability to connect socially with other students, thus developing her social support network.

Working memory abilities begin to develop during infancy and are constantly utilized and refined throughout development (Garon et al., 2008). From 3 to 7 years of age, children demonstrate increasing ability to hold information in mind and use it appropriately (Diamond, 2002). Early advancements in working memory ability might include appropriately representing and maintaining external environmental stimuli (e.g., a toy) in mind, and subsequently updating information (Garon et al., 2008). Later, representations shift to internal stimuli (e.g., constructing goals) and learning to control responses to external stimuli, such as resisting visual distractions (Jacques & Marcovitch,

2010). As working memory develops, the number of representations that can be held in mind (i.e., working memory capacity) increases, as does the sophistication of the processing required for such information (Jacques & Marcovitch, 2010). These abilities provide the foundation for later representations, including abstract conceptual representations from internal processing (e.g., planning and prioritizing). Techniques focused on goal setting, planning, prioritizing, and increasing working memory capacity may alleviate symptoms of stress (Bomyea & Amir, 2011; Krishnan, Feller, & Orkin, 2010).

It is interesting to note that there is a balance between the number of items held in working memory and the level of processing required for such items. It seems that when there are many items, demands on working memory increases, resulting in fewer resources available for processing (Diamond, 2002). Similarly, greater processing demands seem to reduce the number of items that may be held in working memory. However, individuals who are able to process information more efficiently are likely to require fewer resources that may then be used to store more information (St. Clair-Thompson, 2007). This is one area where learning and applying strategies and techniques may be useful. If students can use strategies or techniques to decrease demands on working memory, they may be able to allocate resources to other areas (St. Clair-Thompson, 2007). For example, learning and applying strategies (e.g., time management) may enable Bailey to collect resources for assignments more quickly and efficiently, allowing her to take some time to develop and maintain her social support network.

Individuals who have poor working memory might experience particular

difficulties in day-to-day functioning. For example, such individuals might have

difficulty representing or maintaining goals in mind (Jacques & Marcovitch, 2010). They

might also have difficulty managing stress, learning new things, directing and

maintaining attention, and responding to emotions (Barkley, 1997; Schmeichel,

Volokhov, & Demaree, 2008). These factors might then contribute to frustration, anger,

and aggressive behaviour (Sprague, Verona, Kalkhoff, & Kilmer, 2011).

Skill development in working memory abilities may assist individuals to respond

to immediate needs more effectively. This may become particularly important when

responding to stress. The information available for threat assessment and appropriate

stress management may be collected and stored in working memory. Appropriately

assessing stress levels and the availability of resources might significantly impact the

course of the stress response and enhance adaptation. For example, cognitive

restructuring is a technique that engages executive functions to enable individuals to

consider multiple interpretations of events (Andreotti et al., 2011; Stein, 2010). These

techniques may develop working memory and promote stress management by facilitating

appropriate problem solving and emotion regulation. In addition, individuals who have

higher working memory abilities might be more proficient at learning and focusing

attention, thus predicting better academic performance (St. Clair-Thompson, 2007).

Training working memory has also been shown to improve fluid intelligence, adaptive

thinking, and problem solving (Jaeggi, Buschkuehl, Jonides, & Perrig, 2008).

Cognitive flexibility. Cognitive flexibility involves the ability to switch between

multiple representations, tasks, or mental states (Miyake et al., 2000). It is often referred

to as set shifting and seems to suggest a fundamental aspect of redirection of attention to various types of information. Attention seems to be foundational for both cognitive flexibility and working memory and may be part of the correlation between these two aspects of executive functioning (Garon et al., 2008). However, cognitive flexibility also bears similarities to response inhibition because it requires disengagement (inhibition) of irrelevant information or tasks, in favour of more appropriate activities. Therefore, cognitive flexibility is considered an important aspect of executive control (Miyake et al., 2000).

Cognitive flexibility is required when an individual is presented with more than one perspective or situation (Jacques & Marcovitch, 2010). These might be competing, requiring the individual to switch between perspectives while maintaining them in mind. Garon et al. (2008) described two different types of shifts: attention shifting and task shifting. Attention shifting involves shifting between stimuli or representations and seems to be dependent on information gathered by the senses, whereas task shifting seems to focus on information that relates to possible behavioural responses (Garon et al., 2008). For example, Bailey may have two classes that have a major assignment due the same day. She may also be caught in the middle of a major argument between two of her friends. In order to meet the deadlines and respond to needs of her friends, she will need to appropriately balance her attention, switching between all aspects of these competing demands for time. She may need to focus the majority of her attention and effort on gathering information and working on her assignments, while occasionally checking in with her friends to determine their levels of need. She will also likely need to switch between possible responses to these stimuli. Appropriate cognitive flexibility will enable

her to refocus her attention on each of these dynamics as required and be able to weigh costs and benefits of possible courses of action.

Initial attention processes seem to begin to develop within the first 6 months after birth (Garon et al., 2008). These processes continue to develop, making significant advancements throughout early and middle childhood (Rueda, Rothbart, McCandliss, Saccomanno, & Posner, 2005). During these stages such gains may be further improved by training. Rueda et al. (2005) observed that attention training enhances performance so that younger children reach the levels of older children sooner, and older children reach adult levels sooner. The most significant effects seemed to occur when training effects were combined with age-related effects (i.e., children who were older and experienced age-related developments were also trained). However, even at 13 years of age with training, children were not yet performing at adult levels (Davidson et al., 2006).

Davidson et al. (2006) had children aged 4 years and 6 to 13 years complete tasks requiring attention to respond accurately. The children were shown a screen separated into two halves with buttons under each half. When an arrow appeared on the screen they were instructed to push the button that the arrow pointed to. In the first task the arrow pointed straight down toward the button on the same side of the screen as the arrow. A subsequent task showed an arrow that pointed diagonally toward the button on the other side of the screen. Children performed well on the first task, but experienced difficulty responding to the second task. Even children 13 years of age were not yet performing at adult levels, indicating that the ability to switch between tasks or mental sets seems to require a longer period of development (Davidson et al., 2006). This ability does not seem to reach adult levels until late adolescence (Jacques & Marcovitch, 2010).

In addition, when cognitive load was increased by adding working memory components (i.e., remembering rules and using them to respond accurately) performance was reduced (Davidson et al., 2006). It is likely that cognitive flexibility may develop relatively late compared to other executive functions.

It is interesting to note that even adult performance was reduced with greater demands on executive functioning (Davidson et al., 2006), indicating that attempting to switch between various demands for attention carries cognitive costs (Miyake et al., 2000). Although students in postsecondary education have likely undergone significant development, their cognitive flexibility may be improved with training to reduce such costs. Training may increase students' ability to recognize and selectively attend to the possible alternative responses required by novel and sometimes conflicting information. Such recognition enables creativity in problem solving and may assist individuals to manage stress more appropriately (Meltzer & Bagnato, 2010). As more unfamiliar and unexpected factors arise greater cognitive flexibility may be required (Davidson et al., 2006). Training may enable the development of greater cognitive flexibility, which may in turn increase individuals' ability to manage or adapt to stress. Stroop tasks, discussed below, may be used to train cognitive flexibility by requiring participants to switch between different sets of rules to respond accurately (Garon et al., 2008).

In summary, shifting attention is important because it determines the ability to gather and update information relevant to completing goals (Jacques & Marcovitch, 2010). Cognitive flexibility and set shifting seem to be significant factors in the regulation of unexpected or unfamiliar situations. As cognitive load increases and greater demands are placed on executive abilities, performance seems to decrease. However,

after training cognitive flexibility may be enhanced, which may assist students to adapt appropriately when they confront the many novel and unfamiliar situations experienced during the first year of postsecondary education.

  Response inhibition. An important factor in reducing stress is the ability to inhibit or control conflicting information. This is referred to as response inhibition, behavioural inhibition, or simply inhibition (Garon et al., 2008). It involves the ability to intentionally and consciously suppress established responses in favour of less dominant but more favourable responses (Jacques & Marcovitch, 2010). For example, when Bailey learns of her boyfriend's desire to end their relationship, her initial reaction might be to become preoccupied with feelings surrounding the loss of her relationship, such as anger or depression. This response has the potential to distract her from focusing on her goals, which may cause her grades to suffer, thus causing greater distress. However, if she can inhibit this initial reaction in favour of more adaptive responses (e.g., by deep breathing to restore cognitive control or by reframing the event more positively to reduce its emotional impact) she can reduce the cognitive load brought on by the stressor (Andreotti et al., 2011; Stein, 2010). This may assist her to focus better on her goals, thereby reducing the stress in her life.

  According to Tamm, Mennon, and Reiss (2002), there are three processes that may be included in behavioural inhibition. First, inhibition may occur if individuals stop or regulate behaviours that have already started. For example, if Bailey first reacts to the break up of her relationship by thinking it is over and becoming depressed, she may actively regulate her reaction by redefining it as a pause in the relationship rather than an end. This may help her to regulate her emotions and manage the resulting stress.

Another indicator of inhibition may occur when individuals increase the amount of time between a stimulus and the response (i.e., delay the reaction time). Thus, when Bailey is preparing for an exam she may choose to engage in deep breathing to regulate the anxiety she knows is coming. Third and lastly, individuals may actively regulate against disruptions from distracting stimuli (i.e., interference). By attending the workshop, Bailey may learn stress management techniques that require the removal of distractions (e.g., deep breathing and mindfulness) or conscious shifting of attention from distractions to a focal point, often breathing patterns. It is interesting to note that response inhibition may also require working memory and cognitive flexibility (Garon et al., 2008).

Like other executive functions, response inhibition starts to develop early and continues to develop and mature throughout childhood and adolescence. Nine-month-old infants have developed simple inhibition abilities, including not touching a stimulating toy at a parent's request (Garon et al., 2008). These abilities increase from simple suppression of dominant responses to delaying an external reward for increasing lengths of time (Garon et al., 2008). For example, the dominant responses during stress include fight, flight, or freeze (Bracha, 2004). Response inhibition may enable individuals to regulate these responses under appropriate conditions to facilitate more positive responses (Greenberg, 2006), such as using deep breathing to respond to anxiety during exams. Response inhibition continues to increase in sophistication and can incorporate working memory demands as children reach 5 to 7 years of age. Response inhibition becomes particularly important for students who are frequently exposed to novelty and the unfamiliarity associated with daily learning. Regulating distractions or intrusive thoughts is important in achieving academic success and reducing the stress and the

negative affect associated with the attempted assimilation of vast amount of information students are exposed to (Kincaid & Trautman, 2010; Meltzer & Bagnato, 2010).

Stroop tests require inhibition of a dominant response in order to respond correctly to accomplish the task (Garon et al., 2008). A classic Stroop task involves written words of colours that are filled in with a different colour, presented on cards. Individuals are asked to give the name of the filled-in colour, rather than read the word. This involves inhibiting the tendency to read the written word. Stroop tasks offer easy and applicable techniques for demonstrating and training inhibitory control. As individuals become accustomed to tasks, the difficulty can be increased by requiring participants to respond according to the rules for one trial and then switching to the dominant response for the next trial (i.e., by having participants switch responses with every other card). Developing response inhibition by performing these and similar tasks can assist individuals with regulating reactions to distracting stimuli, including stress (Greenberg, 2006).

In Chapter 3, reference was made to the increased freedom and independence experienced by first-year students. Without their parents to help manage their behaviour to some degree, first-year students may be more likely to experience difficulty inhibiting dominant responses, such as staying out late with friends with the knowledge that it will affect class attendance, and ultimately academic performance. An inability to inhibit dominant behaviours may result in goals and needs not being met, which can increase students' stress. The proposed workshop may serve to help students understand the stressors they might experience and the relationship between inhibition and meeting needs and goals.

Summary. Three fundamental executive function abilities were presented, including working memory, cognitive flexibility, and response inhibition (Davidson et al., 2006; Jacques & Marcovitch, 2010; Miyake et al., 2000). These abilities have been shown to develop gradually throughout childhood and into adulthood (Bryck & Fisher, 2012; Bunge & Wright, 2007; Sowell et al., 1999). Working memory involves being able to retain information and manipulate it to respond appropriately to present situations, including stress (Baddeley, 1992). Cognitive flexibility is the ability to focus on a variety of factors and has implications in creative problem solving (Miyake et al., 2000). Lastly, response inhibition is the ability to suppress dominant responses and distractions in favour of more appropriate behaviour (Jacques & Marcovitch, 2010). Some tasks and strategies for training these abilities have also been discussed. Training in these executive functions, such as the workshop materials presented in Appendix A, may provide some organization and may enable students to respond appropriately to the stressors they will be exposed to during the transition from high school to postsecondary school. In addition, training executive functions to work together appropriately may promote self-regulation, which is discussed next.

Executive Functions and Self-Regulation

When individuals are able to control how they respond to stress (response inhibition), focus their attention on and switch between relevant factors (cognitive flexibility), and monitor and incorporate environmental information, including their own and others' behaviour (working memory), they are engaging in self-regulation (Blair & Ursache, 2011). Self-regulation presumably provides individuals with a base upon which to guide their own behaviour (Rothbart & Rueda, 2005). Executive functions seem to

integrate and work together to ultimately promote self-regulation, thus enabling

individuals to operate effectively from day to day and across their lifespan (Compton et

al., 2011). This is important because it demonstrates how individuals operate to manage

daily events, including novel and unfamiliar situations (i.e., stress).

Self-regulation, according to Blaire and Ursache (2011), is the conscious and

unconscious management of thoughts, behaviours, emotions, and stress for the purpose of

achieving goals throughout the lifespan. It seems to fundamentally involve aspects of

executive functions in order to meet needs, appropriately channelling attention and

stimulating planning (Blair & Ursache, 2011). Self-regulation may be broken up into

three main branches: cognitive control, behavioural regulation, and emotional regulation.

Cognitive control and behavioural regulation will be addressed together. Two examples,

effortful control and planning, provide examples of behavioural and cognitive control.

Emotion regulation will also be discussed. This material is relevant to stress management

because effective regulation and control of behaviour, cognitions, and emotions through

executive function abilities may help to reduce the impact of stress and increase academic

success for first-year postsecondary students (Dawson & Guare, 2004; Kincaid &

Trautman, 2010; Krishnan et al., 2010; Meltzer & Bagnato, 2010; Stein, 2010).

Behavioural regulation and cognitive control. An important aspect of self-

regulation involves effortful control of thoughts and behaviour. According to Rothbart

and Rueda (2005), effortful control refers to "the ability to inhibit a dominant response to

perform a subdominant response, to detect errors, and to engage in planning" (p. 169). It

is considered a major contributor to self-regulation, enabling individuals to affect the

outcomes of stress. The definition that Rothbart and Reuda (2005) provided is strikingly

similar to the definition of response inhibition, described earlier. However, like many other abilities, effortful control seems to require effective incorporation of several executive functions (Jacques & Marcovitch, 2010). It seems likely that response inhibition is an important factor in effortful control that, when combined with other executive functions, contributes to self-regulation and the management of stress.

Planning and prioritizing are complicated constructs important in achieving goals, reducing stress, and developing self-regulation (Dawson & Guare, 2004; Krishnan et al., 2010). Like effortful control, effective planning seems to depend on a complex interaction between many executive functions (Jacques & Marcovitch, 2010), including adequate working memory abilities (e.g., holding the goal and appropriate information in mind), cognitive flexibility (e.g., considering multiple solutions, including appropriate solutions that might distract from the ultimate goal), and response inhibition (e.g., resisting the temptation to respond too hastily to environmental cues). For example, assume one of Bailey's goals is to maintain a grade-point average of 3.5 because it is a requirement in order to receive further training as a dental hygienist. Appropriate planning may assist her in achieving this goal. However, to plan effectively, thereby reducing the impact of stress, she will likely be required to catalogue and update her progress throughout the semester, always keeping in mind her minimum standard for assignment and exam grades. If she does not achieve the desired grade in one of her classes, she will be required to flexibly think of how it affects the outcome as well as what other possibilities exist for making up the grade. She may not have met the standard for one grade, but she may exceed the standard for others, keeping her goals within reach. Bailey will also be required to limit interference, which may come

externally from friends or family, or internally from intrusive thoughts or procrastination. Inhibiting such distractions is necessary for maintaining and achieving goals. These responses may be strengthened by the strategies and executive function training techniques discussed in the proposed workshops (Appendix A).

Executive functions and affect regulation. Self-regulation also incorporates elements of affect regulation (Koole, Van Dillen, & Sheppes, 2011). Emotion regulation seems to be viewed as a major contributor to stress management (e.g., Koole et al., 2011; Stein, 2010). Many of the techniques discussed in the proposed workshop (Appendix A) focus on activating executive functions to assist with the regulation of emotions. For example, one of the goals of mindfulness meditation seems to be the development of awareness and acceptance of threats to one's sense of self, which may restore control to enable the internal regulation of the impact of stress (Brown, Ryan, & Creswell, 2007).

Regulation of emotions includes any attempt to shape the type, strength, or duration of emotional experiences or expressions (Schmeichel et al., 2008). Regulation of emotion also involves attempts to control where, when, and how emotions are experienced and expressed (Quirk & Beer, 2006). Emotional expression differs from emotional experience. Expression relates to outward behaviours exhibited when emotions are experienced. Emotional experiences are internally represented and may or may not result in emotional expression (Schmeichel et al., 2008). Following these definitions, Schmeichel et al. (2008) suggested that attempts to regulate emotions might be accomplished through response-focused (e.g., suppression) or antecedent-focused (e.g., reinterpretation or cognitive reappraisal) means. Response-focused regulatory attempts are likely used to regulate emotional expression, and antecedent-focused

attempts seem to apply to emotional experiences. Effective emotion regulation to manage stress seems to apply most directly to regulation of emotional experiences (Schmeichel et al., 2008).

Executive functions seem to play a critical role in emotion regulation. Schmeichel et al. (2008) observed that individuals who possess higher working memory capacity seem to be able to regulate the impact of stress through emotional expression and emotional experiences more effectively and successfully than individuals low in working memory capacity. Such individuals were able to use suppression to regulate emotional expression more effectively. This seems to indicate that individuals with higher working memory capacity have more control over their emotions. In addition, such individuals demonstrate more effective use of cognitive reappraisal to reduce emotional experiences (Schmeichel et al., 2008). Cognitive reappraisal involves interpreting emotionally arousing events as neutral, and is associated with lower stress levels and higher psychological well-being (Schmeichel et al., 2008; Troy et al., 2010). It is interesting to note that, unless they were specifically instructed to use suppression or cognitive reappraisal, individuals high in working memory capacity demonstrated the same levels of emotional expression and experience as controls. This seems to indicate that the proposed workshop might be useful by providing the specific instruction and application of such strategies to enable more successful responses to stress.

Quirk and Beer (2006) noted that individuals might attempt to manage stress exposure by increasing positive emotional experiences and decreasing negative emotional experiences. These attempts may occur at conscious or automatic levels (Quirk & Beer, 2006). At the conscious level, individuals may attempt to regulate emotions by actively

choosing the people they associate with and the activities they become involved in, focusing on those that foster positive affect. Simultaneously, individuals try to suppress negative affect by reducing interaction with people or events so associated. These attempts may directly apply to postsecondary students selecting social support networks and other related postsecondary experiences to facilitate quick and lasting adaptation.

Quirk and Beer (2006) also noted that attempts to activate the prefrontal cortex by attempting to regulate emotions resulted in reduced activation of the limbic system, which is associated with emotions and emotional expression. Limbic regions of the brain seem to develop and mature faster during adolescence than prefrontal areas, which develop and mature more gradually into young adulthood (Casey, Jones, & Somerville, 2011). This indicates that decision making may likely be governed by emotional experiences rather than cognitive factors until the prefrontal cortex develops and matures (Casey et al., 2011). This does not mean that all decisions are emotionally based. Rather, emotionally-based decisions may be more likely, especially during emotionally-charged situations. In some ways, this might contribute to risky or more impulsive behaviour during exposure to challenges or threats (Casey et al., 2011). For example, students may be more likely to drink alcohol to cope with stress. However, with increased prefrontal and executive function maturation associated with young adulthood there is greater opportunity for emotionally-charged situations to be governed by cognitive control networks and strategies, such as those described below.

Executive Functions, Stress, and Resilience

In Chapter 3 it was noted that stress may impair executive function abilities by reducing blood flow to the prefrontal cortex and increasing blood flow to areas associated

with immediate survival (Ahs et al., 2006; Tillfors et al., 2001). This may be particularly true of chronic or inescapable stress. Compas (2006) discussed how stress ironically affects these abilities despite their utility in promoting appropriate responses to stress. It is important to recognize that stress does not eliminate such cognitive functioning completely, and that individuals may still be able to respond to stress using cognitive means (see Schmeichel et al., 2008). As individuals practice skills that activate executive functions, especially during stress, it is likely that such responses may increase, making it easier to respond similarly in future challenges.

Matthews and Campbell (2010) observed a reciprocal relationship between working memory and stress such that high working memory demands increased stress, and stress increased working memory demands. It may be likely that developing greater working memory capacity might enable individuals to respond to stress in a manner that facilitates learning and memory (Bomyea & Amir, 2011). It is important to recognize that the stress response is natural and may be required for effective adaptation. According to Stein (2010), moderate stress can enhance academic performance on oral presentations and exams. However, higher levels of stress seem to have detrimental effects on many abilities including attention, memory, communication, organization, and inhibitory control (Stein, 2010). Therefore it seems appropriate not to eliminate the stress response, but to respond appropriately and quickly, enabling activation of the parasympathetic nervous system, which seems to promote executive function abilities, including memory, cognitive flexibility, and appropriate decision making (Ghacibeh et al., 2006a, 2006b; Martin et al., 2004).

Sprague et al. (2011) also made some interesting observations about stress and executive functions. They found individuals with a history of aggression were more affected by the stressors associated with daily living. These stressors might include jobs, deadlines, finances, and health. Students likely share these daily stressors, but might also have a few others including attending classes, keeping up with reading and homework, homesickness, and dating. However, executive function abilities seemed to moderate aggressive responses to stress. Executive function abilities may enable individuals to appropriately inhibit reactions and regulate affect following stress exposure. In addition, working memory may promote effective processing of stressors, which might make inhibiting aggressive responses more achievable.

Appropriate novelty may help to facilitate the training of executive functions such as working memory or cognitive flexibility (Sale et al., 2009). For example, one important aspect of engaging executive functions to respond to stress seems to be conscious, consistent, directed attention. Gains in executive function appear to be lost if progress is inconsistent or individuals become accustomed to tasks or strategies (Diamond & Lee, 2011). Jaeggi et al. (2008) observed that introducing progressive changes to training interventions could reduce individuals' tendency to engage in subconscious automatic processing. Individuals need to maintain attention to keep up with the changes. Such changes encourage individuals to engage executive function processes in a controlled environment, thus contributing to cognitive development and fluid intelligence (Jaeggi et al., 2008). This may provide appropriate practice, which may promote appropriate responses to stress when situations are less controlled.

The emphasis on progressive changes seems to be particularly important for maintaining the engagement of working memory. As individuals acquire skills and become familiar with information, less effort is required, which may decrease activation of associated brain regions (Dahlin, Backman, Stiggsdotter Neely, & Nyberg, 2009). This need for progressive changes to continue activation of executive functions is intriguingly similar to notions of stress response activation due to novelty. It seems that moderate amounts of novelty may result in appropriate amounts of stress and activation of executive functions. Thus, the proposed workshop intends to provide practice by introducing appropriate novelty to train executive function abilities to respond to stress.

Moderate changes to the way individuals respond to stress can increase resilient outcomes and promote adaptive functioning. According to Eisenberg et al. (2003), resilient outcomes likely depend on frontal lobe maturation and corresponding gains in self-regulation. Buckner, Mezzacappa, and Beardslee (2003) suggested that appropriate self-regulation could be a significant factor in promoting resilience. Buckner et al. observed that highly self-regulated individuals also demonstrated strong executive function abilities. Such individuals also exhibited many positive traits, including diligence, flexibility, organization, discipline, concentration, and appropriate problem-solving (Buckner et al., 2003), and were more likely to regulate emotions effectively, thus contributing to mental health and resilience. Importantly, it is likely possible for individuals to learn these skills and abilities. Specific techniques and strategies that may be used to activate executive function abilities to promote such outcomes are discussed next.

Executive Function Training and Strategies

There are a variety of training techniques and strategies that could be incorporated to improve executive functioning and stress management. Some of these strategies are listed and explained below and are included in the proposed workshop (Appendix A). As mentioned above, these tasks likely involve more than one executive function; therefore, for simplicity the executive functions that tend to be trained during the tasks are listed during the discussion of each task. The ability of executive function training tasks to transfer to other tasks is also explored.

Enriched environment. Many animal studies refer to an enriched environment as a significant contributor to the development of executive function abilities (Sale et al., 2009). An enriched environment is one that ensures frequent and complex interaction with inanimate objects and social interaction (Sale et al., 2009). Such environments construct appropriate conditions to promote self-regulated learning through exploration, social stimulation, and cognitive and physical exercise. The postsecondary environment itself may provide an enriched environment for postsecondary students that can stimulates cognitive, social, and physical activity. Therefore, under ideal circumstances students are participating in an enriched environment that promotes the development of executive functions. It is important to recognize the importance for students to manage stress and anxiety by moderating their effects, thus optimizing the potential benefits of the enriched environment.

Deep breathing. As discussed in Chapter 3, activation of the stress response results in several physiological changes, including increased heart rate, rapid breathing, and changes in circulation and digestion. Behavioural interventions may be used to

interrupt this pattern to restore balance and reduce anxiety (Antony & Norton, 2009). For example consciously changing breathing patterns from rapid and shallow to more methodical and deep can alter the stress response and allow the body to relax. Deep breathing occurs when the diaphragm contracts to draw air deep into the lungs (Davis et al., 2008). This type of breathing utilizes the full capacity of the lungs and occurs naturally during sleep. Deep breathing reverses the stress response by engaging the parasympathetic nervous system, discussed earlier. It has many benefits on the body and brain, including reduced heart rate and muscle tension, and decreased anxiety (Davis et al., 2008). Deep breathing also restores cerebral blood flow, enabling the prefrontal cortex to activate executive function abilities, which may be used to respond to stress.

Planning and time management (goal setting and prioritizing). Executive functions are important for a variety of tasks, including planning, organizing, and decision making (Blair & Ursache, 2011). It is likely that exercises that require individuals to engage in these behaviours may activate and exercise executive functions. Dawson and Guare (2004) stated planning, goal setting, and prioritization require executive function abilities and serve to develop self-regulation of behaviour, including management of stress. Similarly, Krishnan et al. (2010) explained that these tasks lead to better time management, which has also been found to increase academic success and alleviate stress. Therefore, tools (e.g., handouts) to assist with these tasks are included as part of the proposed workshop (Appendix A). Bailey may be able to use these tools to proactively respond to predictable stress, such as meeting deadlines. These tools may assist with stress management and executive function development.

Verbal self-instructions. A simple strategy that activates executive function abilities involves verbalizing commands internally or externally. Jacques and Marcovitch (2010) discussed the importance of speech and verbal ability to manage executive functions. It seems that giving oneself verbal or silent commands makes switching tasks easier, resulting in greater cognitive flexibility (Jacques & Marcovitch, 2010). Verbal and silent commands may also access the phonological loop, thus contributing to maintenance of working memory (Baddeley, 1992). Verbal self-instructions also seem to enable individuals to self-regulate more effectively (Duncan & Cheyne, 2002), perhaps by promoting focused attention and inhibition. These benefits seem to be the same whether commands are verbal and auditory or silent (Kray et al., 2004). Verbal instructions may also facilitate appropriate responses to stress by requiring individuals to slow their reaction time enough to develop and articulate alternatives. For example, Bailey may reduce procrastination by verbally instructing herself to complete small tasks, thus making small progressive steps to complete assignments and reduce her stress level.

Cognitive restructuring. Schmeichel et al. (2008) discussed the role cognitive reappraisal (restructuring or reframing) as a useful strategy for reducing emotional expression and experiences. Offering neutral appraisals or alternative explanations of emotional stimuli may enable individuals to exert the influences of working memory over emotional or stressful experiences. Doing so may contribute to appropriate affect regulation. Similarly, Devonport and Lane (2006) indicated that appropriate ongoing appraisal of stress may enable individuals to utilize coping mechanisms viewed as adaptive. According to Cormier, Nurius, and Osborn (2009), cognitive reframing may be achieved by identifying perceptions, emotions, body sensations, and behaviours resulting

from a situation and how they interact and influence one another. Individuals may then develop alternative perceptions that reduce the emotional impact of the situation (Andreotti et al., 2011). Cognitive restructuring may enable individuals to change the way arousing information is encoded, thus reducing its power (Cormier et al., 2009). This may also reduce the detrimental effects of the stress response.

Cognitive restructuring seems to activate many executive function abilities. For example, focusing on the situation and interpreting events accurately or appropriately requires working memory. Developing alternative interpretations and shifting between cognitive, emotional, and behavioural awareness requires cognitive flexibility. Suppressing reactions or increasing reaction time in favour of more appropriate alternative responses requires response inhibition. Practicing this strategy may train individuals to incorporate executive functions to promote adaptive responses to stress. For example, if Bailey performs poorly on her first exam in a class she may choose to actively regulate her affect by developing neutral or positive alternative interpretations, such as focusing on the different styles instructors use in constructing exams. Now that she is familiar with the style used, she may develop more effective study techniques for future exams.

Physical exercise. Executive function development and stress reduction may also occur as a result of exercise. Physical exercise has many benefits on stress. For example, it may relieve symptoms of stress and anxiety by decreasing muscle tension and (MacFarlane & Montgomery, 2010). According to MacFarlane and Montgomery (2010), physical exercise may work with cognitive restructuring by assisting individuals to develop alternative perceptions of events. Individuals who engage in exercise report less

perceived stress than individuals who are sedentary (MacFarlane & Montgomery, 2010). Interestingly, exercise may be considered a form of controlled physical stress and may enable individuals to practice responding appropriately to stress (MacFarlane & Montgomery, 2010).

Physical exercise also has benefits on cognitive functioning. Cardiovascular fitness training has been shown to increase performance on executive function tasks (Colcombe & Kramer, 2003). These benefits may correspond to increased blood flow and oxygen transfer. Cardiovascular exercise also has benefits on learning and memory (Colcombe & Kramer, 2003). Diamond and Lee (2011) similarly reported executive function development in response to physical exercise. Therefore, discussions about physical exercise and its benefits on executive functioning and stress management is an important addition to the proposed workshop.

Stroop tasks. Another task that assesses and activates executive functions is the Stroop task (see Garon et al., 2008, for an explanation of Stroop tasks of various complexities). The original Stroop task presents individuals with single words printed on a card. These words are most commonly the names of colours that are printed in a different colour (e.g., the word "blue" printed in red). To activate response inhibition, individuals are shown these cards and instructed to state the colour that the word is presented in, thus inhibiting the dominant response to read the word on the card. Subsequently requiring individuals to switch between responding according to the original instructions for one card and then reading the word presented on the next card can activate working memory and cognitive flexibility. Individuals are asked to respond as quickly as possible.

Another Stroop test uses numbers instead of words. These numbers are listed a certain number of times (e.g., 22222, or 55) and participants are required to answer by stating how many times the number is presented. Complexity may be introduced by requiring individuals to switch between stating the number that is repeated and stating how many times the number is presented on the next card. As discussed earlier, executive functions may promote stress management. It is likely that these tasks may be appropriate techniques for training executive functions to enable such benefits.

Karbach and Kray (2009) used another Stroop-like task to assess and train cognitive flexibility. They used pictures of fruit and animals that were large or small in size and instructed participants to either state whether the picture shown was an animal or a fruit, or state whether the picture was large or small. Some participants were asked to switch between the two instructions. All participants were asked to respond as quickly as possible. These tasks trained set shifting, working memory, and response inhibition. After the tasks were completed, the participants completed a set of cognitive tests. Karbach and Kray (2009) observed that training through this task improved executive functioning in other areas, indicating that training transferred to other cognitive domains, referred to as transfer effects. This indicates that such tasks may be used to help manage stress. Therefore, Bailey may be able to practice this strategy to develop her ability to focus on appropriate instructions and limit distractions, which may enable her to focus on and complete assignments and exams more effectively.

Working memory tasks (digit span and letter memory). The forward and backward digit-span test is a common task used to assess and activate executive functions (Young, Sawyer, Roper, & Baughman, 2012). This task is used in the Weschler Adult

Intelligence scales as a measure of attention and working memory (Young et al., 2012).

The forward digit-span task requires individuals to remember and repeat progressively

longer lists of single-digit numbers, and corresponds to maintaining attention and holding

information in mind. The backward digit-span task requires individuals to do the same

thing, except this time repeating the list of numbers in reverse order. This requires

individuals to hold the list in mind and mentally manipulate it to answer correctly, which

places greater cognitive demand on working memory. Individuals with higher working

memory capacity have demonstrated a greater ability to suppress intrusive thoughts that

may be brought about by anxiety and depression, thus reducing the impact of stress

(Bomyea, & Amir, 2011).

Similar tasks have been developed to similarly activate working memory. For

example, Miyake et al. (2000) used a letter memory task that involves repeating

progressively longer lists of letters (Appendix A). Individuals are asked to listen to the

list and repeat back the last four letters in the list. As the list grew, individuals are

required to incorporate the new letter and drop the oldest. To make this more cognitively

demanding individuals might be required to rehearse the last four letters backward. This

task may assist Bailey to develop skills in assimilating and implementing new

information, which can facilitate learning. It may also provide controlled stress

inoculation for her test anxiety, which can help her performance on exams.

Games and other programs. Diamond and Lee (2011) summarized some

important programs and activities that have demonstrated significant gains in executive

function development. Their report focused on executive function advancements for

children (for a comprehensive list of programs see Diamond & Lee, 2011). Some of the

activities listed are developmentally appropriate for postsecondary students and relatively inexpensive. These include computer games (CogMed), aerobic exercise, martial arts, and mindfulness practices (Diamond & Lee, 2011). Similarly, other games, such as "Simon Says" may activate and train executive function abilities (Jacques & Marcovitch, 2010). Games may be altered to require greater cognitive demands to make training more intensive (Appendix A). Such games may provide practice using executive function abilities in a controlled environment so that they may be applied to other more stressful events.

Mindfulness. Mindfulness is a practice involving meditation suggested to have a variety of benefits (Siegel, 2010). Mindfulness requires an individual to have an intimate awareness of one's own experiences with an emphasis on nonjudgmental acceptance of the present moment (Siegel, 2010). Mindfulness may be accomplished by focusing attention on internal and external phenomena, including sights, sounds, aromas, felt senses, thoughts, emotions, and attitudes without bias or judgment (Brown et al., 2007). Individuals are instructed to first focus attention on breathing and to gradually extend their awareness to other aspects of the present moment. As thoughts divert to past experiences or future concerns, individuals are instructed to gently and nonjudgmentally return attention to the present (Siegel, 2010).

Practicing mindful acceptance of all aspects of an individual's life has many benefits. The acceptance and nonjudgment enables individuals to forgive themselves and avoid the detrimental effects of negative evaluations and emotions (e.g., fear, worry, shame, guilt, and embarrassment). Mindfulness also fosters adaptability by increasing the amount of time between stimulus and response, enabling individuals to hold

information in mind and reflect on it (working memory), thus promoting problem solving

and reducing impulsivity (Brown et al., 2007; Siegel, 2010). Mindfulness can increase

individuals' feelings of connection to their surroundings, including their social and

romantic relationships (Siegel, 2010). It may also promote immune system functioning.

Interestingly, by accepting events instead of attempting to control them, individuals may

increase their perceived personal control, which can increase self-regulation (Brown et

al., 2007).

Mindfulness seems to activate all aspects of executive functioning. It uses

working memory abilities by requiring individuals to focus on information collected from

the present moment (Siegel, 2010). It also seems to activate cognitive flexibility and

attention abilities by requiring individuals to shift between macro (whole aspects) and

micro (specific factors) levels of awareness (Brown et al., 2007). Mindfulness may also

implement inhibition abilities by requiring individuals to reduce distractions from

intrusive thoughts (Brown et al., 2007). Such activation seems to indicate that

mindfulness is particularly appropriate for executive function development. Bailey may

benefit from mindfulness because it can assist her to monitor and develop acceptance of

her stressors. Such acceptance can reduce the emotional impact of receiving poor grades

or feeling misjudged by others, which can reduce distress.

Transfer of trained abilities to other domains. Executive function training

seems to have mixed results in terms of successful implementation into various cognitive

domains. Several researchers have observed transfer effects (Dahlin et al., 2009; Jaeggi

et al., 2008; Karbach & Kray, 2009; Olesen et al., 2004). However, Diamond and Lee

(2011) indicated that transfer effects are often limited to tasks that are similar to those being trained, and that they do not transfer to other cognitive domains.

According to Dahlin et al. (2009), even short periods of executive function training yield important behavioural changes. However, training is more likely to yield larger and more long-term benefits if it is presented consistently for longer periods of time and is progressively challenging (Diamond & Lee, 2011). Similarly, transfer effects are more likely to occur after more training. Olesen et al. (2004) reported positive changes after brief training, with greater changes occurring after longer periods of training. It is interesting to note that such changes persisted over several weeks, indicating lasting development of executive functions and the occurrence of plasticity (Bryck & Fisher, 2011; Olesen et al., 2004). If such changes to executive function abilities persist, lasting benefits to stress management may also occur.

Summary

This chapter focused on the various types of executive functions with a specific focus on three that seem to be separable but correlated. These include working memory, cognitive flexibility, and response inhibition (Davidson et al., 2006; Jacques & Marcovitch, 2010; Miyake et al., 2000). Particular emphasis was given to how these and other executive functions work together to promote self-regulation, including affect regulation (Blair & Ursache, 2011). This indicated that cognitive, emotional, perceptual, and behavioural domains may be interconnected and may affect one another. Executive functions were explored in the context of the stress response and the promotion of resilience. Finally, specific tasks, strategies, and activities were discussed in relation to executive function training that may transfer to other cognitive domains and enable

individuals to either reduce the impact of or otherwise manage the stress response. As such the tasks and strategies explored may promote both the development of executive functioning abilities and adaptive responses to stress.

Conclusion

Executive functions are required for appropriate decision making in day-to-day life throughout the lifespan. Appropriate development of executive functions may promote resilient outcomes by enabling individuals to respond more appropriately to stressors. Using the training suggestions explained above, individuals might be able to develop their executive functions. Continual practice of such techniques may provide important experiential effects on the brain, facilitating appropriate plastic changes to brain structure and function, thus enabling individuals to maintain positive adaptations for responding to stress. These changes may then promote resilience throughout the lifespan.

Chapter Six: Discussion

The executive functions described above may have the potential to enable

students to respond more adaptively to stress, thus promoting resilient outcomes and the

accomplishment of goals. The training techniques explained may facilitate this process.

However, there are important aspects of this project worthy of consideration. This

project and the proposed workshop (Appendix A) have some important strengths that

support the conclusions that have been drawn. There are also some important limitations.

These points are discussed below, along with some proposed areas of future research that

may be appropriate and worthy of consideration. Finally, this chapter concludes with a

comprehensive list of resources used to compile the information presented in the project

and the proposed workshop.

Project Strengths

This project demonstrates a number of strengths. Following are detailed

descriptions of possible strengths demonstrated in the report and in the manual.

The literature reviews (Chapters 3-5) possess a variety of strengths. First, they

are comprehensive. I used many studies, including primary sources (research articles),

and many secondary sources (review articles), to balance empirical research with new

ways of linking together and explaining research findings (Gall, Gall, & Borg, 2007).

This helped to provide a clear explanation of terms and constructs. In addition, I used

original research from authors who either developed particular constructs or made

significant contributions. For example, Hans Selye (1978) was referred to as the father of

stress. Selye's initial research shaped the work of virtually all other research about stress

and the stress response. Luthar et al. (2000) made significant contributions to the concept

of resilience and also made important attempts to unify resilience research by providing distinguishing definitions of terms. Newer studies were also included to demonstrate how the concepts in the literature reviews have changed and current directions being pursued. Secondly, the literature reviews are presented in a progressive format, such that the problem (stress) is presented first, the goal (resilience) is presented second, and the proposed solution (executive function) is presented third. These literature reviews are designed to teach readers about these concepts so they can become confident about the material in order to facilitate the workshop.

Another strength of this project is found in the research used to inform the literature reviews. Most of the research articles used were quantitative in nature and used analyses of variance or analyses of covariance to derive information between comparison groups (Gall et al., 2007). For example, Cicchetti and Rogosch (2007) performed an analysis of covariance with two groups of children who were similar in age and socioeconomic status, but differed in maltreatment. Children in the maltreatment group had experienced neglect or some form of abuse. The researchers wanted to determine the degree of resilience demonstrated by this group by comparing salivary cortisol levels, an indicator of subjective stress. Using this method of analysis, Cicchetti and Rogosch (2007) were able to observe resilience. In addition, many of these studies used population samples that were primarily postsecondary students (e.g., Beck et al., 2003; Beilock, 2008), making it easy and appropriate to generalize to the target population of this project (Gall et al., 2007). These studies generally used well-established assessment measures that increased the validity and reliability of their findings. For example, tools to assess executive functions were often the same across studies and have been well

established as effective measures for executive function abilities (see Miyake et al., 2000). In addition, studies about stress used biologically-based measurements, such as salivary cortisol levels (e.g., Wolfe et al., 2001) or self-report questionnaires (e.g., Lund et al., 2009), to corroborate their findings.

An important inclusion in the report is the hypothetical scenario of the fictitious character, Bailey. Her life experiences and challenges were taken from studies that gave suggestions of typical stressors experienced by first-year students. This scenario enabled the reader to observe how the constructs discussed in the report might apply to students.

The workshop also possesses some important strengths (Appendix A). First, it is presented in a manner consistent with formats that are familiar to students. The workshop addresses individual learning styles by combining visual, auditory, and kinesthetic elements, including discussions, handouts, visual aids, and physical activities. Secondly, the techniques and interventions used in the workshop are based on research for effectively eliciting appropriate changes. Finally, the workshop is presented in a flexible format suitable for tailoring and adjusting to meet the current needs of students. Importantly, there is also potential to refer students for individual counselling should they demonstrate specific needs not met by the workshop.

Project Limitations

There are some important limitations to the project and the workshop that must be explored. These include researcher bias, population limitations, the role of transfer effects of executive function training, a lack of studies (short term or longitudinal) focusing on the effects of executive function training on the stress response, the role of

culture, a lack of empirical testing of the proposed workshop, and professional limitations of experience.

Researcher bias. A bias in research may be described as the tendency for facts or data to be altered, falsified, misrepresented, or ignored to suit the needs of the project (Gall et al., 2007). Such studies may have been quick to report generalizability of findings.

Individual bias must also be addressed. It may be that, as the author of this project, I selected references and sources that reflected only the data that I was looking for. Although this and other personal biases were unintentional, the potential for bias is important for the readers and for me, as the author, to be aware of.

Population limitations. Many of the studies reported in Chapter 4 (Resilience), and Chapter 5 (Executive Functions) are focused on children, and may not be representative of the target population. The nature of resilience naturally focuses on children who more obviously demonstrate this construct. Similarly, the majority of studies about executive function training focus on children and older adults because these populations frequently demonstrate developing, reduced, or compromised executive function abilities. In addition, because executive function training studies seem to use children or older adults, there may be a lack of identifiable developmentally appropriate training techniques or interventions for young adults, which may impact the workshop.

Transfer effects. Executive function training seems to have a particular focus on transfer effects. Transfer effects may be defined as the ability of training-induced changes to be found in areas of cognitive functioning not directly manipulated by training tasks (Dahlin et al., 2009). There are few studies that report transfer effects beyond the

specific executive function ability activated by the training, indicating that training

techniques used in the workshop may only transfer to tasks that are closely related to the

training tasks (Olesen et al., 2004).

Lack of studies evaluating effects of executive function training on stress. An

important limitation of the report and the workshop is that there are few studies (short

term or longitudinal) that specifically observe the effects of executive function training

on responding to stress. Such studies would likely significantly increase the strength of

the claims made throughout this report. However, the rationale for these claims is based

on theory.

The project is theoretically driven. Due to the lack of studies specifically

observing the effects of executive function training on stress management, much of the

information presented in the project and the workshop is theoretical. Many concepts are

linked together based on hypothetical relatedness. However, despite the heavy

theoretical review, I approached my writing as being a major comprehensive guide,

enabling the reader to absorb as much or as little information as desired. This flexibility

of comprehension does not compromise the workshop because potential facilitators are

instructed to read the material provided in the chapters as a reference guide.

Cultural implications. Throughout the project research is typically based on

North American culture with people of European descent. During Chapter 3 cultural

dimensions were briefly explored in relation to unique stressors that might be

experienced by cultural minority students (see Phinney & Haas, 2003). Similarly,

Cicchetti and Rogosch (2007) included children from diverse cultures in their study about

maltreatment and resilience. However, the role of culture in developing temperament and

executive functions may result in differential effects for international or cultural minority students compared to Caucasian students (Rothbart & Rueda, 2005). The specific stressors and pathways to resilience of individuals from other cultures may also vary, which may make some of the techniques and strategies less applicable. Taken together, the suggestions in this project for developing executive functions to respond to stress may not appropriately apply to students from other cultures.

A lack of empirical testing of the workshop manual. A significant limitation of this project is that the proposed workshop (Appendix A) has not been subjected to empirical testing. Until data have been collected to evaluate the workshop, its validity is unknown. As the author of this project, I cannot state that the workshop will achieve the suggested results, nor can I be certain how students will react to the workshop.

Professional limitations of experience. I am a new counsellor. As such I lack experience that other counsellors might have regarding workshop administration. This lack of experience may affect the quality of the manual. In addition, I have limited experience presenting workshops. With further training and experience, the proposed workshop may undergo important revisions that may make it more appealing and applicable to the target population.

Areas of Future Research

The development of executive functions can have important implications for students and others experiencing the detrimental effects of chronic or intense stress. Further research regarding the effects of executive function training on the stress response would be important. Taking such research further, it would be important to link such effects to brain plasticity by conducting longitudinal studies. In addition, it would

be prudent to use first-year students to support the population requirements stipulated by the workshop.

The role of culture has not been sufficiently addressed by this project or the workshop (Appendix A). Another possible area of future research might focus on the effects of cultural differences manifest in values and upbringing, and how it shapes subjective stress. The role of culture in how resilience might be demonstrated and how executive functions might develop differently should also be explored.

Finally, as the author of this project, it is necessary to conduct research specifically focused on the effectiveness of the workshop and the possible effects it has on first-year students. It would also be relevant to seek feedback from the readers of this project and the workshop materials to determine its efficacy.

Taken together with the paucity of research about the effects of executive function training on responding to stress, this project may present an opportunity to conduct original research. The proposed workshop may be a beneficial tool in initiating such research.

Summary

The intent of this chapter was to familiarize readers with some of the strengths and limitations of this project. College and university counsellors may have an increased awareness about some of the benefits and problems inherent in the research and may be able to more accurately assess whether the workshop is appropriate for their students. This chapter also discussed some suggestions to guide future research endeavours.

Project Summary

As previously described, the purpose of this project was to increase awareness and understanding of postsecondary counsellors and students regarding some of the unique stressors experienced by first-year post secondary students and to provide information about potential adaptive responses to such stress. Chapter 1 provided a brief overview of the subjects presented in this project. Chapter 2 presented the research process used to inform the project and the proposed workshop and discussed the research focus and my ethical position regarding the development of this project. Chapters 3, 4, and 5 provided literature reviews regarding the stress response, the construct of resilience, and executive functions respectively. Finally, Chapter 6 focused on some of the strengths and limitations of this project and the proposed workshop, including suggested areas of future research.

This concludes Part 1 of this project. The information presented serves as a foundation for Part 2.

Part 2 organizes the information presented throughout this project into a series of workshops that may be used as a template for disseminating such information and training to students. It is separated into four sections with suggested lesson plans that correspond to the stress response, resilience, executive functions, and executive function training techniques. These lesson plans are suggestions only, and may be modified according to the needs of the students at the discretion of the facilitators.

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Appendix A:

SURVIVING THE FIRST YEAR OF POSTSECONDARY EDUCATION:

FOUR WORKSHOP SESSION PLANS

Note: All images in this manual are from Microsoft Clip Art; Microsoft allows customers to use clip art for personal, educational, and non-profit applications.

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Preamble

PURPOSE:

The following workshop guide is intended to assist counsellors who work in postsecondary education counselling centres to facilitate workshops for postsecondary students. The topics for these workshops include the stress response, resilience, executive function development, and executive function training techniques. In this workshop guide are 4 session plans, facilitator's notes, handouts, and activity descriptions.

RECOMMENDATIONS AND FACILITATOR QUALIFICATIONS:

Counsellors intending to facilitate the following workshops are strongly recommended to read Chapters 1 through 6 of the project (Bruce, 2012) prior to implementation to understand the context of the workshops. Counsellors should also possess a master's degree in counselling psychology or a related program.

COPYRIGHT STATEMENT:

As the author of this project, I waive my copyright of this project and workshop. Although I have organized these concepts in a particular way, the research, and the techniques and strategies have been taken from the work of others. Potential facilitators

should feel free to build upon my work. However, individuals who intend to utilize this material should make appropriate reference to credit me as author accordingly:

Bruce, M. (2012). *Stress-reducing brain exercises: A psychoeducational workshop for first-year postsecondary students* (Unpublished master's project). University of Lethbridge, AB, Canada.

In text: (Bruce, 2012)

TARGET POPULATION OF THE WORKSHOP:

The workshops are to be used with first-year college or university students. The project gives specific attention to first-year students, but the information and strategies included in the workshops may apply to students in other years of study. Accordingly, the workshops, if desired by the facilitator, could be opened to all postsecondary students.

WORKSHOP LENGTH:

Workshops are designed to coincide with students' class schedules. Consequently, each workshop is intended to be 50 minutes in length.

WORKSHOP DELIVERY OPTIONS:

Facilitators may choose to implement one workshop independently, or all workshops as a series over a period of 4 weeks, or all at once in a 4-hour block, depending on the needs of the students. Facilitators are free to modify the structure of the workshops or to adapt them to construct a therapeutic group.

WORKSHOP FORMAT:

These stress management workshops have been designed for about 6 to 8 students in attendance. However, the workshops could be adapted for a larger or smaller audience. For example, check-in and check-out times may be given more or less time according to the size of the audience and needs of the students. Each workshop will be closed to late arrivals after the first five minutes, which is usually after facilitators have welcomed the students and given a brief orientation to the workshop. Until then, students who have not previously signed up may enter and participate at the discretion of the facilitator (i.e., if the workshop has available space).

REGISTRATION FOR THE WORKSHOP:

There is no recommended format for registration. Students seeking to attend a workshop may sign up for them in advance at counselling services or drop in prior to starting.

INSTRUCTIONS FOR USE:

Facilitators are granted considerable flexibility with regard to workshop operation. Although ample material has been supplied in Chapters 3 to 5, facilitators are encouraged to research and implement additional strategies and techniques that may be applied, or include strategies more appropriate for meeting the needs of diverse populations of students (e.g., minority students, mature students, etc.). Facilitators may also alter the strategies, the demonstrations, or the handouts to suit the needs of the students. The workshop guide is intended to be used in an ethical manner to provide help and avoid

causing harm. Facilitators are encouraged to refer to their appropriate codes of ethics and operate accordingly when implementing these workshops.

CAUTIONS AND LIMITATIONS:

Facilitators should refer to the strengths and limitations of the workshops listed in Chapter 6 of the report. In addition, facilitators are advised to inform students that the workshops are not intended to provide therapy, unless the facilitator has modified it to be conducted as a therapeutic group. Students who have been diagnosed with psychological disorders and others who may be experiencing particular difficulty in adapting to postsecondary life may be more appropriately served by attending one-on-one counselling through counselling services for assistance specific to their needs. Students should also be informed of their rights with regard to workshop attendance (refer to lesson plans).

Workshop One: The Stress Response

Reminders for this Workshop:

1. Review Chapter 3 in the report for more detailed information about the stress response and its effects on first-year students. Also review Chapter 5 for an explanation of the proposed strategies, interventions, and handouts.

2. Become familiar with techniques and strategies that might be more appropriate for diverse populations of students, including cultural minorities and mature students.

3. This workshop is the first of 4 total sessions. The current workshop may be presented independently, or in a series with the other workshops.

4. The following is only a suggested lesson plan. The facilitator is encouraged to adapt the material to his/her presentation style and to the needs of the audience.

Audience:

First-year postsecondary students are the intended audience for this workshop. The workshop may also be tailored to suit other populations of students (e.g., second-year students or mature students).

Length of the Session:

This session is 50 minutes in length (to coincide with students' classes and enable them to be punctual for classes following the workshop).

Workshop's Core Objectives:

1. To provide structure and give the intent of the workshops.

2. To provide information about the stress response and its effects on the body, the brain, mental health, and academic performance.

3. To normalize students' experiences of postsecondary education.

4. To offer a simple strategy that may be used to reduce the effects and symptoms of the stress response.

Materials Needed:

☐ Paper and pens or pencils.

☐ Sign-up sheet and handouts.

☐ Workshop feedback forms.

☐ Flip chart or laptop for presentation of core material and visual aids.

☐ Appropriate markers for writing notes or drawing diagrams (dry-erase or permanent).

☐ Cookies and bottles of water.

Pre-Workshop Preparation:

1. Read Chapter 3 of the project report to become familiar with the material. Also review Chapter 5 to become familiar with the activities, techniques, and handouts.

2. Prepare flip charts and/or PowerPoint with the core material and visual aids.

3. Copy handouts and the attendance/sign-up sheet, or obtain the attendance/sign-up sheet from administrative staff.

4. Confirm the room is booked.

5. Gather materials needed and bring them to the room.

6. Set up the room for the workshop. Arrange chairs in a circle or semi-circle (include extra chairs for individuals who attend on a drop-in basis), set up the computer and projector (ensure presentation will operate appropriately), or the flip charts. Lay out the refreshments.

Workshop One: The Stress Response - Agenda

Time (mins)	Agenda Items (Objectives)

5   **Welcome and Orientation (Objective 1):**

Facilitator warmly welcomes students as they arrive to the workshop, takes attendance, and directs them to the refreshments and to get settled.

When the session starts, the facilitator introduces himself/herself and briefly shares his/her background that qualifies him/her to run this workshop.

Facilitator informs the audience of the counselling services provided on campus.

Facilitator addresses guidelines and expectations for participation, which may include:

- Respect for others.
- Privacy limitations.
- The right to leave at any point in the workshop.

Facilitator explains the purpose of the workshops and how they will be executed, also stating the topics that will be addressed. For example, the facilitator may explain that the workshops will be presented as a series of individual workshops intended to give education and provide some strategies or techniques for promoting resilient responses to stress. As such workshops are not intended to provide therapy.

2   **Outline Current Workshop (Objective 1):**

Facilitator may choose to explain that the workshops make contributions to one another and encourage students to participate in any or all the workshops in the series; however, attendance at each session is not required for attendance at later sessions.

Facilitator introduces the current workshop as the first of 4 by posting and discussing a chart or PowerPoint slide indicating the outline of the workshop.

20   **Presentation of the Workshop Material (Objectives 2 and 3):**

Facilitator presents material as outlined in Chapter 3 of the project report. The presentation should include the following information in greater detail:

- Definition, description, and prevalence of stress and the stress response, including common environmental, biological, and psychological causes.

- Biological mechanisms of the stress response, including hormones released and the common positive and negative effects on the body and the brain, including behaviours, body sensations, emotions, and cognitions (with reference to Figure 1 in Chapter 3 or a drawing of a similar diagram on the flip chart).

- Ask students to disclose 1 or 2 of their main concerns, noting similarities between members. Facilitators may add other applicable stressors common to postsecondary students (especially those affecting academic performance). If this discussion occurs, the facilitator may need to monitor or adjust time accordingly. Alternatively, the facilitator may discuss typical stressors and ask if students identify with them.

- Discuss stressors unique to other populations as appropriate to the dynamics of the group.

15   **Applied Intervention or Technique (Objective 4):**

Facilitator should discuss some common techniques for stress management and select one to conduct with the students as an example. Please refer to Workshop One: Facilitator Notes, for some handouts and a description of a recommended intervention, recorded below. Explanation of handouts and how they may be used to decrease stress levels as described in Chapter 5 of the report. Facilitator may choose to explain how these exercises activate the prefrontal cortex (executive functions) to help manage stress. Facilitator may also choose to exclude the handouts from the workshop.

2   **Summary and Brief Introduction of Next Workshop (Objective 1):**

Facilitator summarizes core themes about the stress response and the challenges experienced by first-year postsecondary students. Facilitator outlines the next workshop, which includes defining and discussing resilience, and how it relates to stress.

5   **Check-out and Feedback Sheets (Objective 1):**

Facilitator conducts a round-robin check-out that may focus on material learned from the workshop. This may include asking a question, such as:

- What is one thing that stood out to you about today's workshop?
- How might you use the information from today's workshop?
- What is one thing you learned from today's workshop?

Facilitator distributes feedback sheets (see Appendix B) to obtain information about what did and did not work well about the workshop.

Facilitator thanks students for attendance, informs them of the date and time of the next workshop, and collects feedback forms as the students leave.

Post-Workshop Tasks:

☐ Clean up the room and collect all workshop items.

☐ Complete paperwork (e.g., attendance/sign-up sheets, etc.).

☐ Collect, read, and reflect on the feedback sheets received.

☐ Debrief the experience with a colleague, if necessary.

☐ Reflect on and record personal impressions about the workshop, making note of what may be improved for next time.

Workshop One: Facilitator Notes

Applied Intervention or Technique: Deep Breathing[1]

(approximately 10 minutes)

Information:

Breathing is not something that people often think about. It just happens automatically, without any thought. The brain and the body take care of it unconsciously to enable people to devote energy to other goals. However, breathing is unique because it can be under both conscious and unconscious control (Antony & Norton, 2009). The way people breathe has more influence on their sense of well-being than they think. Regulating breathing can help reduce tension, anxiety, and panic, and can have a calming, relaxing influence on the mind and the body.

The lungs facilitate the process of gas exchange using hundreds of tiny air sacks, called alveoli. They interact with tiny blood vessels to allow oxygen to enter the blood stream. The heart then pumps the oxygen-rich blood to the cells of the body and the brain, where it is exchanged for carbon dioxide. The carbon dioxide is then brought back to the lungs where it can be exchanged for oxygen, repeating the process throughout every moment of life.

Breathing occurs because of repeated contraction and relaxation of the diaphragm and the intercostal muscles between the ribs. These actions create the conditions that make filling the lungs with air possible. Although they work in tandem for the same goal, they are independent muscles and can result in different breathing patterns. Shallow breathing, or thoracic breathing, occurs when the intercostal muscles are primarily used and is indicated by the chest raising and lowering. This breathing pattern is less effective and can be brought on by internal or external conditions, including poor posture, stress, anxiety, and panic among other things. It can result in fatigue, depression, and increased anxiety and panic. Other symptoms may include many of the physical symptoms discussed earlier. Importantly, shallow breathing results in less oxygen being transported to the brain and the body.

Deep breathing (diaphragmatic breathing) utilizes the full capacity of the lungs by utilizing both the intercostal muscles and the diaphragm. Under average conditions this type of breathing occurs naturally during sleep. It is deeper, slower, and more methodical than thoracic breathing. Deep breathing reverses the stress response by engaging the parasympathetic nervous system, discussed earlier. It has many benefits on the body and

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[1] Material adapted from Davis, M., Eshelman, E. R., & McKay, M. (2008). *The relaxation & stress reduction workbook.* Oakland, CA: New Harbinger Publications, Inc.

brain, including reduced heart rate and muscle tension, and decreased anxiety. The following exercise is intended to provide instruction and practice for deep breathing.

Instructions:

To change breathing patterns, it must be brought into conscious awareness and practised. It might be helpful to practise deep breathing in a place free of distractions and at a specific time (e.g., in your bedroom before sleep) until it becomes more familiar. However, this technique should also be used whenever symptoms of stress are identified. The following activity may help to increase awareness and to establish this process:

1. Allow yourself to find a comfortable position (sitting or lying down) that will enable you to relax.

2. If you feel safe and comfortable doing so, close your eyes.

3. Scan your body for any discomfort or tension and allow your body to shift to accommodate.

4. Become aware of the way you are breathing. Don't change it. For now, just notice it. Observe some of the different sensations associated with your breathing. Notice the feel of the air rushing in through your nose, the coolness of the air on your nasal cavity, and the way it feels as your lungs fill and empty. Notice the muscles that are being used, and the rise and fall of your stomach and your chest. If your stomach moves the most, you are doing deep breathing.

5. Consciously alter your breathing pattern. You may want to start by exhaling sharply and completely, and then inhaling by making your stomach move first, followed by your chest. It may take a few attempts to develop the appropriate pattern. Take your time. You do not need to fill your lungs up completely. Your body knows how much air it needs. Just focus on filling the lower part first.

6. You may choose to lengthen out your breaths by breathing slower. Notice how your breathing pattern affects your body. Do you feel more relaxed? Do you feel tension reducing? Feel the effects of gravity and allow your full weight to sink into the floor or your chair. Some people may feel like they have just lost control of their body. If this happens to you, move your legs or your head and recognize that you still have control of your muscles. You may focus your attention on the points of contact your body is making with the ground or your chair, allowing you to develop a sense of security, and a feeling of safety and support. You have control over how far to take this exercise.

7. If you notice your thoughts shifting to other things, just notice the change, and then consciously shift your attention back to your breathing. Engage your senses on the experience as you breathe.

8. Take a few more breaths and when you feel ready, open your eyes and turn your attention back to the room and the present moment.

9. Notice any differences in the way you feel now compared to prior to the activity.

10. Try to perform this exercise every day, giving as much time as you feel is appropriate. Even five minutes is helpful in reducing anxiety and stress and can bring energy to your body and mind.

If time permits, it may be appropriate to discuss some of the observations made by the students as they completed the exercise.

Source:

Antony, M. M., & Norton, P. J. (2009). *The anti-anxiety workbook.* New York, NY: The Guilford Press.

Workshop One: Handout #1 – Goals and Obstacles

Goals can maintain your focus and allow you to view stressors more objectively. In the space provided, break down your goals by writing down main goals and the sub-goals that may assist you in achieving your main goal. Your main goal may be whatever you want to accomplish (e.g., academic, career, social, stress management etc.). Also write down potential obstacles and possible solutions to overcome these obstacles. Doing this can help you focus your attention on your objectives.

Goal:

Sub-goals:

1.   3.
2.   4.

Obstacles:

1.   3.
2.   4.

Potential Solutions:

•   •
•   •
•   •

Goal:

Sub-goals:

1.   3.
2.   4.

Obstacles:

1.   3.
2.   4.

Potential Solutions:

•   •
•   •
•   •

Workshop One: Handout #2 – Priorities

Understanding priorities can assist individuals to organize their goals and their time. Such management may enable individuals to take proactive measures to respond to stress. Oftentimes priorities are difficult to rank because they may shift depending on needs and circumstances.

Types of priorities vary and may include tasks, goals, relationships (family and social), self-care, academic responsibilities, financial obligations (bills, rent, etc.), work, community, or expectations.

List your priorities below as they are brought to your attention.

Where have you placed yourself, the care of your own well-being?

Just like cars needs energy (gas and electricity) to run properly, people have basic needs that may enable them to meet other priorities more effectively.

It may be appropriate to place self-care at the top of your list to assist you in meeting other priorities.

Workshop One: Handout #3 – Deadlines

Writing down all deadlines may assist you in effectively planning ahead, which is another stress management technique. This can help to organize your semester and reduce your stress before it occurs. Please list your assignments, projects, and exams below with the dates they are due in chronological order. You may also choose to list other important events. Put a star beside major tasks that require advanced work and planning.

Due Date:	Class:	Item:

Workshop Two: Stress and Resilience

Reminders for this Workshop:

1. Review Chapter 4 in the report for more detailed information about resilience.

2. Become familiar with techniques and strategies that might be more appropriate for diverse populations of students, including cultural minorities and mature students.

3. This is the second of 4 total workshop sessions. The current workshop may be presented independently or in a series with the other workshops. It is not a requirement for students to attend a previous workshop to attend the current workshop. Student participants are likely to vary from group to group.

4. The following is only a suggested lesson plan. The facilitator is encouraged to adapt the material to his/her presentation style and to the needs of the audience.

Audience:

First-year postsecondary students are the intended audience for this workshop. The workshop may also be tailored to suit other populations of students (e.g., second-year students or mature students).

Length of the Session:

This session is 50 minutes in length (to coincide with students' classes and enable them to be punctual for classes following the workshop).

Workshop's Core Objectives:

1. To provide structure and give the intent of the workshops.

2. To educate students about resilience as a construct and a possible outcome despite stress.

3. To offer an intervention to promote resilience.

Materials Needed:

- ☐ Paper and pens or pencils.

- ☐ Sign-up sheet and handouts.

- ☐ Workshop feedback forms.

- ☐ Flip chart or laptop for presentation of core material and visual aids.

- ☐ Appropriate markers for writing notes or drawing diagrams (dry-erase or permanent).

- ☐ Cookies and bottles of water.

- ☐ Package of polished rocks.

Pre-Workshop Preparation:

1. Read Chapter 4 of the project report and become familiar with the material. Also review and become familiar with activities, techniques, and handouts.

2. Prepare flip charts and/or PowerPoint with the core material and visual aids.

3. Copy handouts and the attendance/sign-up sheet, or obtain the attendance/sign-up sheet from administrative staff.

4. Confirm the room is booked.

5. Gather materials needed and bring them to the room.

6. Set up the room for the workshop. Arrange chairs in a circle or semi-circle (include extra chairs for individuals who attend on a drop-in basis), set up the computer and projector (ensure presentation will operate appropriately), or the flip charts. Lay out the refreshments.

Workshop Two: Stress and Resilience - Agenda

Time (mins)   Agenda Items (Objectives)

5   Welcome and Orientation (Objective 1):

Facilitator warmly welcomes students as they arrive to the workshop, takes attendance, and directs them to the refreshments and to get settled.

When the session starts, the facilitator introduces himself/herself and briefly shares his/her background that qualifies him/her to run this workshop.

Facilitator informs the audience of the counselling services provided on campus.

Facilitator addresses guidelines and expectations for participation, which may include:

- Respect for others.
- Privacy limitations.
- The right to leave at any point in the workshop.

Facilitator explains the purpose of the workshops and how they will be executed, also stating the topics that have been and will be addressed. For example, the facilitator may explain that the workshops are being presented as a series of individual workshops intended to give education and provide some strategies or techniques for promoting resilient responses to stress. As such workshops are not intended to provide therapy.

2   Review Previous Workshop and Outline Current Workshop (Objective 1):

Facilitator may choose to summarize the main points about the stress response and its effects on postsecondary students. (Workshops make important contributions to one another. Providing a brief summary of previous material may facilitate greater understanding and application of the current workshop.)

Facilitator posts and discusses a chart or PowerPoint slide indicating the outline of the workshop.

Facilitator may choose to explain how the current workshop builds on the previous workshop, which may include:

- Appropriate and adaptive responses to stress indicate resilience.
- People can learn appropriate responses to stress, thus promoting resilient outcomes.
- Resilient patterns may persist throughout the lifespan.

20   **Presentation of the Workshop Material (Objective 2):**

Facilitator presents material as outlined in Chapter 4 of the project report. The presentation should include the following information in greater detail:

- Definition and description of resilience, including indicators of resilience (exposure to significant adversity, successful adaptation, and sustainability of recovery or functioning).
- Discuss environmental, biological, and dispositional risk and protective factors related to resilience (distribute and explain the worksheet about risk and protective factors).
- Discuss perceived control and its relationship to stress.
- Discuss how principles of brain plasticity may apply to resilience.

15   **Applied Intervention or Technique (Objective 3):**

Facilitators should select an appropriate intervention or technique that addresses resilience. Please refer to *Workshop Two: Facilitator Notes*, for some handouts and a description of a recommended intervention, recorded below. Handouts may be distributed without specific explanation, offered instead as suggestions or tools to help students understand personal resilience.

2   **Summary and Brief Introduction of Next Workshop (Objective 1):**

Facilitator summarizes core themes about resilience as it relates to stress and outlines the next workshop: How executive function development can operate within the context of brain plasticity to promote resilience.

5	**Check-Out and Feedback Sheets (Objective 1):**

Facilitator conducts a round-robin check-out that may focus on material learned from the workshop. This may include asking a question, such as:

- What is one thing that stood out to you about today's workshop?
- How might you use the information from today's workshop?
- What is one thing you learned from today's workshop?

Facilitator distributes feedback sheets to obtain information about what did and did not work well about the workshop.

Facilitator thanks students for attendance, informs them of the date and time of the next workshop, and collects feedback forms as the students leave.

Post-Workshop Tasks:

☐ Clean up the room and collect all workshop items.

☐ Complete paperwork (e.g., attendance/sign-up sheets, etc.).

☐ Collect, read, and reflect on the feedback sheets received.

☐ Debrief the experience with a colleague if necessary.

☐ Reflect on and record personal impressions about the workshop, making note of what may be improved for next time.

Workshop Two: Facilitator Notes

A Metaphor for Resilience
by Mark Bruce

- Pass the package of rocks out to the students and instruct them to select a rock that stands out to them.

- After all students have selected a rock, ask them what influenced their decisions. Reasons might include appearance, smooth texture, shape, colour, or size.

- Ask students to carefully observe their rocks and notice all of the details. Then ask them how old they think the rock might be.

- When students suggest the rocks are likely very old, ask them what types of major events the rocks might have experienced. Events might include ice ages, extreme heat or pressure, and the polishing process.

- Ask how students suppose these events may have affected the rock's appearance.

- Suggest that the very things that students find pleasing about the rock may have been caused by some of the intense events they were required to pass through.

- Suggest that people and rocks share some similarities. The types of events we have experienced have shaped us into who we are today, leaving positive elements (e.g., lessons learned and personality development).

Extra: Time permitting, facilitators may choose to use the rocks in a relaxation/guided imagery experience, such as in the following script:

Allow yourself to find a comfortable position and take a few deep breaths. As you breathe in, carry the air into the bottom of your lungs so that you fill up your lungs completely. Then breathe out, allowing the air to completely escape. Do this a couple of times and feel your body relax and any tension release.

If it helps, and you feel safe doing so, close your eyes and turn your attention to the rock in your hand. Use your senses to feel the weight of the rock in your hand. Close your hand around the rock so that you make a fist. Notice the amount of space the rock takes up in your hand. Gather some information about the rock. Is it cool or warm, smooth or rough, big or small? Is it heavier or lighter than expected? Recognize that all of these qualities are acceptable and appropriate. There is nothing wrong with these rocks, despite the events they have experienced.

These rocks have made it through many events and will continue to resiliently endure future situations. Similarly, you have experienced many events. You will continue to experience events that will cause stress and put strain on you. But just like this rock, you can continue to endure and resiliently adapt. When you are ready, take another couple of deep breaths and return your attention to the room.

Process the experience and ask students what their observations were.

Workshop Two: Handout #1 – What are Your Risk and Protective Factors?

	RISK FACTORS	**PROTECTIVE FACTORS**
Environmental *(Factors that are external to the individual.)*	*E.g., Poverty, low parental involvement, etc.*	*E.g., Social support, extra-curricular involvement, etc.*
Biological *(Factors that are dependent on genetics, hormones, diet, exercise, and sleep.)*	*E.g., Poor diet, thyroid condition, etc.*	*E.g., Appropriate sleep, regular exercise, etc.*
Dispositional *(Factors that are dependent on personality characteristics.)*	*E.g., Neuroticism, laziness, etc.*	*E.g., Extraversion, positive appraisal, etc.*

What did you learn about yourself in relation to managing stress?

What is one thing within your control that you will consider changing?

What are you proud about on this list?

Workshop Two: Handout #2 – When Have You Demonstrated Resilience?

What past incidents have caused me significant stress (e.g., exams or family situations), but I handled it appropriately?

What did I do well?

What did I learn about myself or what I need to do to cope better?

What does the way I responded indicate about me?

How can I apply the above experiences to help me cope with my current stressors?

Workshop Three: Executive Functions and Stress

Reminders for this Workshop:

1. Review Chapter 5 in the report for more detailed information about executive functions and an explanation of the proposed activities, strategies and handouts.

2. Become familiar with techniques and strategies that might be more appropriate for diverse student populations, including cultural minorities and mature students.

3. This workshop is the third of 4 total sessions. The current workshop may be presented independently, or in a series with the other workshops. It is not a requirement for students to attend a previous workshop to attend the current workshop. Student participants are likely to vary from group to group.

4. The following is only a suggested lesson plan. The facilitator is encouraged to adapt the material to his/her presentation style and to the needs of the audience.

Audience:

First-year postsecondary students are the intended audience for this workshop. The workshop may also be tailored to suit other populations of students (e.g., second-year students or mature students).

Length of the Session:

This session is 50 minutes in length (to coincide with students' classes and enable them to be punctual for classes following the workshop).

Workshop's Core Objectives:

1. To provide structure and give the intent of the workshops.

2. To educate students about the basic structures and functions of the brain with particular emphasis on the prefrontal cortex and executive functions.

3. To discuss three basic executive function abilities and the contributions they make to self-regulation, responding to stress, and developing resilience.

4. To introduce factors that contribute to the development of executive functions.

Materials Needed:

☐ Paper and pens or pencils.

☐ Sign-up sheet and handouts.

☐ Workshop feedback forms.

☐ Flip chart or laptop for presentation of core material and visual aids.

☐ Appropriate markers for writing notes or drawing diagrams (dry-erase or permanent).

☐ Cookies and bottles of water.

Pre-Workshop Preparation:

1. Read Chapter 5 of the project report and become familiar with the material, activities, and techniques.

2. Prepare flip charts and/or PowerPoint with the core material and visual aids.

3. Copy handouts and the attendance/sign-up sheet, or obtain the attendance/sign-up sheet from administrative staff.

4. Confirm the room is booked.

5. Gather materials needed and bring them to the room.

6. Set up the room for the workshop. Arrange chairs in a circle or semi-circle (include extra chairs for individuals who attend on a drop-in basis), set up the computer and projector (ensure presentation will operate appropriately), or the flip charts. Lay out the refreshments.

Workshop Three: Executive Functions and Stress - Agenda

Time (mins)   **Agenda Items (Objectives)**

5   **Welcome and Orientation (Objective 1):**

Facilitator warmly welcomes students as they arrive to the workshop, takes attendance, and directs them to the refreshments and to get settled.

When the session starts, the facilitator introduces himself/herself and briefly shares his/her background that qualifies him/her to run this workshop.

Facilitator informs the audience of the counselling services provided on campus.

Facilitator addresses guidelines and expectations for participation, which may include:

- Respect for others.
- Privacy limitations.
- The right to leave at any point in the workshop.

Facilitator explains the purpose of the workshops and how they will be executed, also stating the topics that have been and will be addressed. For example, the facilitator may explain that the workshops are being presented as a series of individual workshops intended to give education and provide some strategies or techniques for promoting resilient responses to stress. As such workshops are not intended to provide therapy.

2   **Review Previous Workshop and Outline Current Workshop (Objective 1):**

Facilitator may choose to summarize the main points about resilience, particularly the environmental, biological, and dispositional factors that contribute to resilience. Brain plasticity should also be summarized because it has specific application to the current workshop. (The material from the previous workshops is relevant to the material in this workshop. Providing a brief summary of previous material may facilitate greater understanding and application of the current workshop.)

Facilitator posts and discusses a chart or PowerPoint slide indicating the outline of the workshop.

Facilitator may choose to explain how the current workshop builds on the previous workshops, which may include:

- Dispositional factors contributing to resilience may include the ability to use available information to make appropriate decisions.

- Developing executive functions may enable individuals to increase dispositional protective factors.

- Such development can also encourage positive plastic changes to the brain that can promote resilience currently and throughout the lifespan

20   **Presentation of the Workshop Material (Objective 2 – 4):**

Facilitator presents material as outlined in Chapter 5 of the project report. The presentation should include the following information in greater detail:

- Brief explanation of the different lobes of the brain, including the location of the prefrontal cortex. (Facilitators may wish to use or draw a diagram of the brain showing the main sections.)

- Definition and descriptions of different types of executive function abilities and how they influence behaviour, focusing specifically on working memory, cognitive flexibility, and response inhibition.

- Facilitator may choose to conduct a basic game of Simon Says to illustrate how executive functions work together to accomplish tasks. Please see *Workshop Three: Facilitator Notes*, found below.

- Discuss executive function development, including the developmental and maturational changes occurring in young adulthood.

- Discuss how executive functions work together to promote decision making and self-regulation, and how they may be especially important for responding to stress.

- Discuss how executive function training might promote resilience by assisting individuals to respond appropriately in stressful situations.

15   **Applied Intervention or Technique (Objective 3 and 4):**

Facilitator may conduct another, more complex game of Simon Says to illustrate how executive functions interact to affect behaviour. Also, making greater cognitive demands in a controlled environment (playing games) may provide appropriate practice for training the brain for similar, less controlled stressful environments (e.g., exams).

Facilitator may also choose to review one of the strategies outlined in the facilitator notes, recorded below. These strategies may also be given as handouts. Handouts 2 and 3 from Workshop 1 may also be used because executive function abilities are required to complete them. Please refer to Chapter 5 for more information.

5   **Summary and Brief Introduction of Next Workshop (Objective 1 and 4):**

Facilitator summarizes core themes about executive functions as they relate to responding to stress and explains that more techniques and strategies will be discussed at the next workshop.

Facilitators may indicate that students desiring to attend the next workshop may want to attempt some of the techniques discussed during this session to determine how they affect performance.

5   **Check-Out and Feedback Sheets (Objective 1):**

Facilitator conducts a round-robin check-out that may focus on material learned from the workshop. This may include asking a question, such as:

- What is one thing that stood out to you about today's workshop?
- How might you use the information from today's workshop?
- What is one thing you learned from today's workshop?

Facilitator distributes feedback sheets to obtain information about what did and did not work well about the workshop.

Facilitator thanks students for attendance, informs them of the date and time of the next workshop, and collects feedback forms as the students leave.

Post-Workshop Tasks:

☐ Clean up the room and collect all workshop items.

☐ Complete paperwork (e.g., attendance/sign-up sheets, etc.).

☐ Collect, read, and reflect on the feedback sheets received.

☐ Debrief the experience with a colleague if necessary.

☐ Reflect on and record personal impressions about the workshop, making note of what may be improved for next time.

<u>Workshop Three: Facilitator Notes</u>

Activity: Simon Says

During this activity, the facilitator explains the rules of Simon Says and requires students to respond appropriately. The facilitator may issue commands normally (e.g., "Touch your nose with your thumb"), or may preface the commands with "Simon Says" (e.g., "Simon says, 'touch your nose with your thumb.'"). Students are asked to perform commands only when "Simon Says" to do so. Facilitators should generate these commands randomly so there is no distinguishable pattern. If used as a check-in activity, facilitators may choose to inform students that the game will not end until "Simon says" it is done. Then, after students demonstrate the ability to complete commands appropriately, the facilitator may attempt to trick students by suggesting that the game is over and they are too advanced for it.

When played the first time, Simon Says provides an example of executive functions utilized to guide behaviour. Facilitators may choose to explain how this task demonstrates executive functions, the discussion topic for the current workshop. By way of explanation, facilitators may occasionally refer back to the first game. For example, working memory is required because students must hold the instructions in mind in order to act on them (e.g., the rule about the game ending when "Simon Says" it is). Cognitive flexibility is required to switch between the types of commands to act appropriately. Response inhibition is required to avoid prepotent responses, such as the tendency to act on the commands that are more prevalent in daily life (i.e., regular commands). These executive function abilities contribute to self-regulation and are used when responding to stressful situations.

In the later game facilitators may attempt to increase difficulty by making more challenging demands on executive functions, and requiring greater cognitive control. They may do so by instructing students to alternate their responses. For instance, for the first command students must follow the typical rules. For the next command, students must reverse the rules so that they inhibit performing the command preceded by "Simon says," and perform the regular command. This will put a greater load on working memory, requiring students to mentally manipulate the information to respond correctly. These new rules may be difficult to track for facilitators. One strategy for tracking may be to tap one's left leg as a reminder of the regular rules, and tap the right leg for the reverse rules.

Facilitators may choose to debrief this activity and discuss how exercising executive functions in a controlled environment may provide appropriate training for responding to stressors. Many games similarly place greater cognitive demands on executive functions and may be used to train the brain to respond to stress.

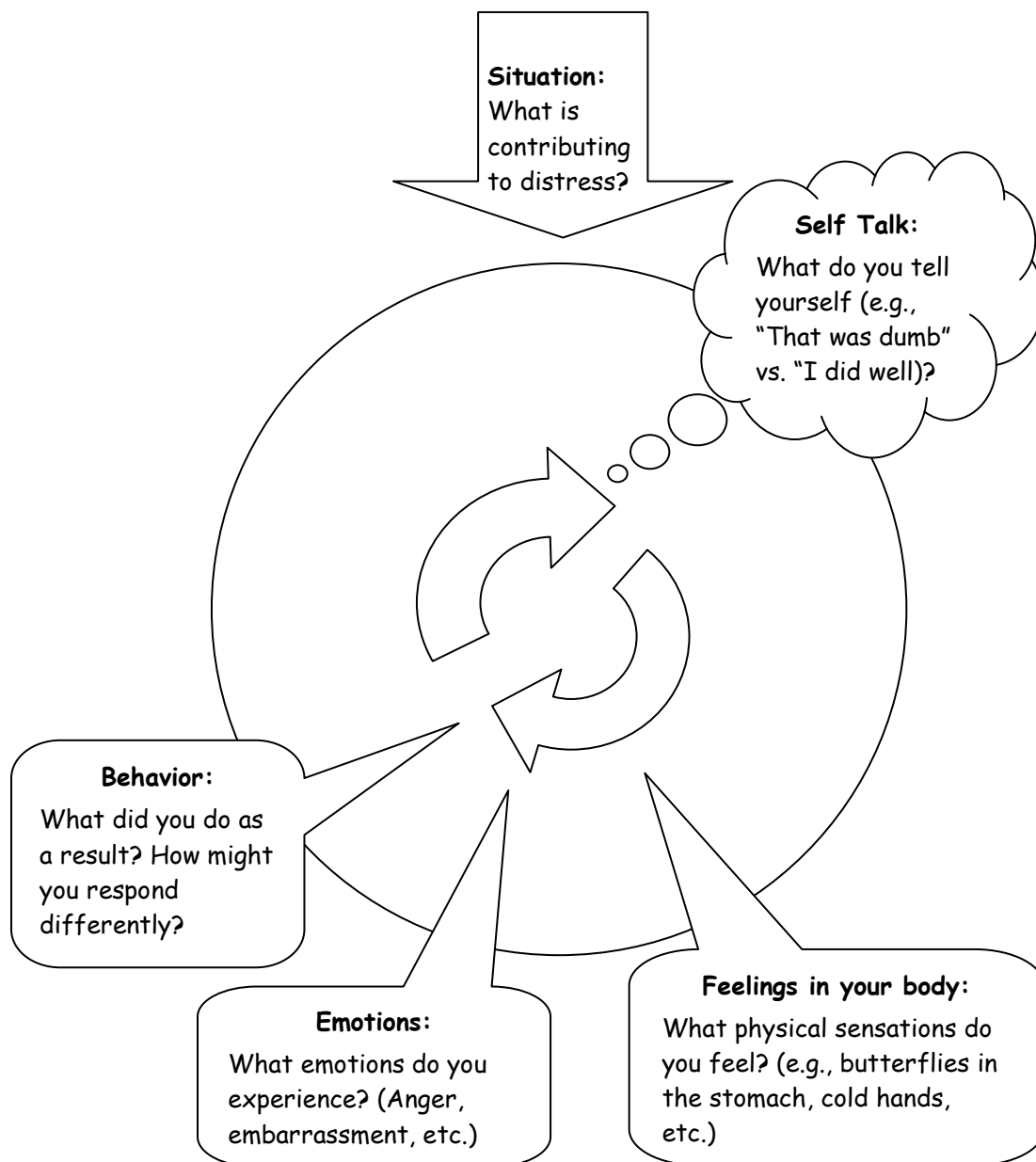**Workshop Three: Strategy #1 – Verbal Self-Instruction**

As explained in the project, verbal self-instructions can enable individuals to more effectively encode information in working memory. This is important because working memory is the centre for processing information in the present. Prior to an expected stressor, individuals may repeat directions to themselves about how to respond, thus increasing their ability to respond appropriately. During unexpected stressors, individuals may similarly give verbal instructions to themselves (e.g., take a few deep breaths) to increase desired outcomes.

In addition, it may help individuals to inhibit responding impulsively during stress. For example, a student may be worried about some upcoming deadlines for a couple of papers. This may increase his anxiety, making it difficult to think and articulate thoughts onto paper. He may struggle for hours sitting in front of a blank piece of paper or computer screen. The student may be able to break this cycle and reduce his anxiety by verbally telling himself to relax. Issuing such a command may cause him to actively alter his behaviour to decrease his anxiety (e.g., by deep breathing or by standing up and walking around to facilitate circulation).

Similarly, issuing verbal commands before completing a series of events may enable individuals to remember all the details. For example, when reviewing a day's class schedule, a student may verbally state the classes she has and the times they occur. She may also choose to state what she intends to do between classes or before she returns home to promote task completion. This may also be beneficial for individuals attempting to remember lists that have not been recorded.

Workshop Three: Strategy #2 – Cognitive Restructuring Circle (CRC)[2]

The following exercise enables individuals to engage in Cognitive Restructuring, a technique that requires manipulation of available information (working memory) to develop self-awareness and alternative explanations. This can help individuals to reduce the effects of stress and to construct alternative responses (Stein, 2010)[3].

Situation:
What is contributing to distress?

Self Talk:
What do you tell yourself (e.g., "That was dumb" vs. "I did well)?

Behavior:
What did you do as a result? How might you respond differently?

Emotions:
What emotions do you experience? (Anger, embarrassment, etc.)

Feelings in your body:
What physical sensations do you feel? (e.g., butterflies in the stomach, cold hands, etc.)

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[2] Used with permission from Dawn McBride (1999; 2007) using the SBFB concept from the YWCA SKFSC (Calgary) Phase Group Manuals.

3 Stein, J. A. (2010). Emotional self-regulation: A critical component of executive function. In L. Meltzer (Ed.), *Promoting executive function in the classroom* (pp. 175–201). New York, NY: The Guilford Press.

Workshop Four: Executive Function Training Techniques

Reminders for this Workshop:

1. Review Chapter 5 in the report for more detailed information techniques and strategies for executive function training.

2. Become familiar with techniques and strategies that might be more appropriate for diverse populations of students, including cultural minorities and mature students.

3. This is the fourth of 4 total workshop sessions. The current workshop may be presented independently, or in a series with the other workshops. It is not a requirement for students to attend a previous workshop to attend the current workshop. Student participants are likely to vary from group to group.

4. The following is only a suggested lesson plan. The facilitator is encouraged to adapt the material to his/her presentation style and to the needs of the audience.

Audience:

First-year postsecondary students are the intended audience for this workshop. The workshop may also be tailored to suit other populations of students (e.g., second-year students or mature students).

Length of the Session:

This session is 50 minutes in length (to coincide with students' classes and enable them to be punctual for classes following the workshop).

Workshop's Core Objectives:

1. To provide structure and give the intent of the workshops.

2. To discuss and demonstrate several techniques and activities for exercising executive function abilities that may promote resilient outcomes to stress.

Materials Needed:

☐ Paper and pens or pencils.

☐ Sign-up sheet and handouts.

☐ Workshop feedback forms.

☐ Flip chart or laptop for presentation of core material and visual aids.

☐ Appropriate markers for writing notes or drawing diagrams (dry-erase or permanent).

☐ Cookies and bottles of water.

☐ Raisins or other small food for the mindfulness exercise, if chosen.

Pre-Workshop Preparation:

1. Read Chapter 5 of the project report and become familiar with the rationale and the processes of the activities, interventions, and techniques.

2. Prepare flip charts and/or PowerPoint with the core material and visual aids.

3. Copy handouts and the attendance/sign-up sheet, or obtain the attendance/sign-up sheet from administrative staff.

4. Confirm the room is booked.

5. Gather materials needed and bring them to the room.

6. Set up the room for the workshop. Arrange chairs in a circle or semi-circle (include extra chairs for individuals who attend on a drop-in basis), set up the computer and projector (ensure presentation will operate appropriately), or the flip charts. Lay out the refreshments.

Workshop Four: Executive Function Training Techniques - Agenda

Time (mins)   **Agenda Items (Objectives)**

5   **Welcome and Orientation (Objective 1):**

Facilitator warmly welcomes students as they arrive to the workshop, takes attendance, and directs them to the refreshments and to get settled.

When the session starts, the facilitator introduces himself/herself and briefly shares his/her background that qualifies him/her to run this workshop.

Facilitator informs the audience of the counselling services provided on campus.

Facilitator addresses guidelines and expectations for participation, including:

- Respect for others.
- Privacy limitations.
- The right to leave at any point in the workshop.

Facilitator explains the purpose of the workshops and how they will be executed, also stating the topics that have been and will be addressed. For example, the facilitator may explain that the workshops are being presented as a series of individual workshops intended to give education and provide some strategies or techniques for promoting resilient responses to stress. As such workshops are not intended to provide therapy.

2   **Review Previous Workshop and Outline Current Workshop (Objective 1):**

Facilitator may choose to summarize the main points about executive function abilities, including the specific types discussed and the contributions they make to self-regulation. (Workshops make important contributions to one another. Providing a brief summary of previous material may facilitate greater understanding and application of the current workshop.

Facilitator posts and discusses a chart or PowerPoint slide outlining the workshop.

Facilitator may choose to explain how the current workshop builds on the previous workshops, which may include:

- Discussion and demonstration of some executive function training techniques and strategies mentioned in the previous workshop.

- Students may become familiar and be able to apply some strategies that may help them develop the executive functions discussed previously.

30   **Presentation and Demonstration of Executive Function Training Tasks/Strategies (Objective 2):**

Facilitator chooses 2 or 3 tasks or strategies from Chapter 5 of the project report to introduce, attempt, and discuss.

Prior to task demonstration, facilitators may choose to provide a brief explanation of the different lobes of the brain, including the location of the prefrontal cortex, noting that the following tasks activate the prefrontal cortex. (Facilitators may wish to use or draw a diagram of the brain showing the main sections.)

Tasks should be able to be performed as a group or in dyads. These tasks may include:

1. **Physical (Cardiovascular) Exercise** (see p. 82 of the report): This strategy will likely be a discussion rather than a demonstration. Facilitators should discuss the benefits of voluntary cardiovascular exercise, including improved performance on executive function tasks, and improved learning and memory, likely because of increased circulation and transfer of oxygen.

2. **Stroop Tasks** (Colour-Word and/or Number; see p. 83 of the report): Facilitators should explain these tasks, also describing the relationship between the executive functions being trained/activated and the potential for such developed executive functions to promote adaptive responses to stress (see *Workshop Four: Facilitator Notes* for exercises).

3. **Letter Memory Task** (see p. 84 of the report): Facilitators should explain this task, also describing the relationship between the executive functions being trained/activated and the potential for such developed executive functions to promote adaptive responses to stress (see *Workshop Four: Facilitator Notes* for exercises).

4. **Mindfulness** (Raisin Exercise; see p. 86 of the report): Facilitators should explain this task, also describing the benefits of mindfulness for developing executive function abilities and for managing stress (see *Workshop Four: Facilitator Notes* for exercises).

Facilitator may choose to incorporate Handouts 2 and 3 of Workshop 1, and Strategies 1 and 2 of Workshop 3. These handouts and exercises also activate executive function abilities and may provide appropriate training.

5   **Summary (Objective 1 and 2):**

Facilitator summarizes core themes of the workshop. Facilitator may also desire to summarize the relationship between stress, executive function abilities, and resilience as explained in the report.

5   **Check-out and Feedback Sheets (Objective 1):**

Facilitator conducts a round-robin check-out that may focus on material learned from the workshop. This may include asking a question, such as:

- What is one thing that stood out to you about today's workshop?
- How might you use the information from today's workshop?
- What is one thing you learned from today's workshop?

Facilitator distributes feedback sheets to obtain information about what did and did not work well about the workshop.

Facilitator thanks students for attendance, informs them of the date when the workshops are likely to be offered again, and provides information about other workshops being offered.

As the students leave, the facilitator collects the feedback forms.

Post-Workshop Tasks:

☐ Clean up the room and collect all workshop items.

☐ Complete paperwork (e.g., attendance/sign-up sheets, etc.).

☐ Collect, read, and reflect on the feedback sheets received.

☐ Debrief the experience with a colleague if necessary.

☐ Reflect on and record personal impressions about the workshop, making note of what may be improved for next time.

<u>Workshop Four: Facilitator Notes</u>

Applied Intervention or Technique #1: The Stroop Task

BLUE GREEN

The Stroop Task activates response inhibition by requiring individuals to respond to directions that operate against prepotent responses (Garon et al., 2008). In the following demonstration, sets of numbers are presented. The facilitators may instruct the students to separate into pairs and to alternate between presenting the numbers and responding to them. Presenters should show the sets of numbers on the worksheet one at a time and wait for the response. After ten sets, the pairs should switch roles.

In addition, the facilitator may choose to develop and present PowerPoint slides with the original Stroop Task (i.e., words for colours printed in conflicting colours) on them and request students to write down the correct response.

To make these tasks more cognitively demanding, facilitators may request that students alternate their responses between the original rules and the prepotent response. For example, with the word colour Stroop Task, individuals must respond by stating the colour the word is written in, and respond to the next word by reading the word.

Sources:

Garon, N., Bryson, S. E., & Smith, I. M. (2008). Executive function in preschoolers: A review using an integrative framework. *Psychological Bulletin, 134*, 31–60. doi:10.1037/0033-2909.134.1.31

Workshop Four: Handout #1 – Number Stroop Task

Complete Trial #1 using the original rules and Trial #2 alternating rules. Present sets to your partner in reverse order.

Trial #1:	Trial #2
5555	11111
666666	33
888	9999
22	555
33	222222
777777	88
9	77777
1111111	6666
44	0
00000	4444444

Answers: 4, 6, 3, 2, 2, 1, 6, 7, 2, 5.   Answers: 5, 3, 4, 5, 6, 8, 5, 6, 1, 4

Applied Intervention or Technique #2: Letter Memory Task[4]

The Letter Memory Task requires working memory abilities (Garon et al., 2008; Miyake et al., 2000). It should be performed in pairs with one individual reading the list of letters, and the other responding. After several sets the pairs should reverse roles. During this task readers should read sets of letters, adding one letter after each response. After each set, responders should repeat back the last four letters read, dropping the oldest letter to accommodate the new letter. To increase the cognitive complexity of this task, responders may be required to repeat the last four letters in reverse order.

FORWARD	BACKWARD
1. H-S-J-R	1. I-T-P-W
2. H-S-J-R-V	2. I-T-P-W-B
3. H-S-J-R-V-S	3. I-T-P-W-B-L
4. H-S-J-R-V-S-A	4. I-T-P-W-B-L-Z
5. H-S-J-R-V-S-A-D	5. I-T-P-W-B-L-Z-K
6. H-S-J-R-V-S-A-D-P	6. I-T-P-W-B-L-Z-K-C
7. H-S-J-R-V-S-A-D-P-Y	7. I-T-P-W-B-L-Z-K-C-J
8. H-S-J-R-V-S-A-D-P-Y-G	8. I-T-P-W-B-L-Z-K-C-J-Q
9. H-S-J-R-V-S-A-D-P-Y-G-X	9. I-T-P-W-B-L-Z-K-C-J-Q-G
10. H-S-J-R-V-S-A-D-P-Y-G-X-M	10. I-T-P-W-B-L-Z-K-C-J-Q-G-F

Answers: HSJR, SJRV, JRVS, RVSA, VSAD, SADP, ADPY, DPYG, PYGX, YGXM

Answers: WPTI, BWPT, LBWP, ZLBW, KZLB, CKZL, JCKZ, QJCK, GQJC, FGQJ

Sources:

Garon, N., Bryson, S. E., & Smith, I. M. (2008). Executive function in preschoolers: A review using an integrative framework. *Psychological Bulletin, 134*, 31–60. doi:10.1037/0033-2909.134.1.31

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., & Howerter, A. (2000). The unity and disunity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive Psychology, 41*, 49–100. doi:10.1006/cogp.1999.0734

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[4] Adapted from Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., & Howerter, A. (2000). The unity and disunity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive Psychology, 41*, 49–100. doi:10.1006/cogp.1999.0734

Applied Intervention or technique #3: Mindfulness (Raisin Meditation)[5]

Mindfulness is an exercise intended to promote one's awareness of the present moment. It operates within the context of meditation, incorporating deep breathing and relaxation techniques. Individuals enrich their experience of the present moment by engaging their senses to gather information about external and internal phenomena in an accepting and nonjudgmental manner.

Mindfulness can increase adaptability, reduce the power of negative emotions, and increase attention, learning, and memory. It can also increase self-awareness and self-acceptance. It may also increase executive functioning by requiring individuals to remain within the present moment, to inhibit intrusive thoughts, and to focus attention on various aspects of one thing (the present).

Facilitator should first determine if any students are allergic to the food item being used (often a raisin). Due to time constraints, this exercise will be abbreviated. The facilitator leads the exercise by providing the following instructions (any questions are rhetorical):

- Find a comfortable position and begin by taking some deep breaths, focusing on the air as it enters your nose and travels down into your lungs, noting where it goes. To facilitate relaxation, air should be taken into the bottom of the lungs.

- (Facilitator should pause to allow a minute or two of breathing). Pick up your raisin and hold it in your palm. Use your eyes to gather as much information as you can about the raisin, as if you have never seen one before. Notice its bumps and grooves, its colour, its size, and its shape. Notice any thoughts or feelings that arise.

- Now use your sense of touch to gather information. Notice the space it takes up in your hand and notice its weight. Explore its texture by rolling it between your thumb and your fingers.

- Pay attention to your arm as you raise it to bring the raisin to your ear. Notice any sounds as you gently squeeze the raisin between your thumb and your finger.

- Slowly bring the raisin to your nose and engage your sense of smell to gather information about it. Does it have any aroma? Notice any thoughts or feelings that arise.

- Now slowly bring the raisin to your mouth and place it on your tongue, holding in place against the roof of your mouth. Use your sense of touch first to notice any additional information. Roll the raisin around in your mouth, but resist the urge to bite or swallow it. Notice how this information differs from when you held the

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[5] Used with permission from Dr. Ronald D. Siegel, PsyD. (personal communication, March 27, 2012).

    raisin in your hand. Notice any changes in the raisin since it was placed in your mouth.

- Slowly and carefully place the raisin between your teeth and notice how it feels. Then bite down once slowly, fully experiencing the pressure required and the changes in the raisin. Notice also the changes that occur in your mouth. Pay attention to the taste and notice any thoughts or urges that arise. Notice these as if you have never tasted a raisin before.

- Move the once-bitten raisin back onto your tongue and explore the changes again. Then slowly continue to chew the raisin, feeling the pressure of your jaws and noticing how the raisin continues to change. When you are ready, move the raisin to the back of your mouth, noting the movements required to do so, and swallow. Pay attention to what happens as you swallow.

Facilitator may wish to briefly discuss the exercise and what stood out to students as they participated. Discuss what sensations might have been new or heightened, and what thoughts, impressions, and feelings arose.

Discuss with students how this activity relates to managing stress. For example, some connections that you may want to address include:

- ~ Mindfulness may help them to relax.
- ~ Mindfulness may help them to clear their minds and reduce worries.
- ~ Mindfulness exercises may increase personal awareness of emotions, body sensations, and cognitions.
- ~ Mindfulness may help them to focus attention and think flexibly to develop creative solutions to problems.

Facilitator should direct students to www.mindfulness-solution.com for a more complete audio recording of the raisin exercise, and more information and audio recordings about mindfulness meditation activities.

<u>Appendix B: Workshop Evaluation Form</u>

1. My experience of today's workshop was:
   ☐ Excellent (9–10)
   ☐ Good (7–8)
   ☐ Fair (4–6)
   ☐ Poor (0–3)

2. Things I liked about today's workshop include (check all that apply):
   ☐ Facilitator was   ☐ Material was applicable.   ☐ Refreshments.
      engaging.   ☐ Strategies were useful.   ☐ Other:_____
   ☐ Material was   _____
      interesting.   _____

3. Things I disliked about today's workshop include (check all that apply):
   ☐ Facilitator was   ☐ Strategies were unhelpful.   ☐ Other:_____
      unprepared and boring. ☐ Material was repetitive or   _____
   ☐ Material did not apply.   not new.   _____

4. My expectations for learning how to manage stress were:
   ☐ Met
   ☐ Somewhat met
   ☐ Not met

5. Today I experienced the following: (check all that apply)

   ☐ Learned more about stress,   ☐ Learned more about myself.
      resilience, or executive   ☐ Gained understanding of the role of
      functions.   executive functions in responding to stress.
   ☐ Learned applicable   ☐ Symptom relief.
      skills/strategies for managing ☐ Other:_____
      stress, fear, or anxiety.

6. One thing I would like to see in future workshops is:

   _____

   _____

7. Please include any additional comments that might help us serve you and your needs better.

   _____

   _____

   _____

Questions have been derived from the following:

Corey, M. S., Corey, G., & Corey, C. (2010). *Groups: Process and practice* (8th ed.). Belmont, CA: Brooks/Cole.

Parcover, J. A., Dunton, E. C., Gehlert, K. M., & Mitchell, S. L. (2006). Getting the most from group counseling in college counseling centers. *The Journal for Specialists in Group Work, 31*(1), 37–49. doi:10.1080/01933920500341671

Zuckerman, E. L. (2008). *The paper office* (4th ed.). New York, NY: The Guilford Press.