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***When Boredom Gives Birth to Motivation:
Interrelations Between Interest-Enhancing Strategies,
Interest, and Self-Determination***

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A thesis submitted to the School of Graduate Studies and Research of the University of
Ottawa as partial fulfilment of the requirements for the degree of Doctor of Philosophy

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This thesis is dedicated, with all my love, to

Dean Fournier

who shared the trials and tribulations of this journey with me.
Words cannot express my gratitude for his patient understanding
and loving support.

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ABSTRACT

On the foundation of the works of Sansone and her colleagues (1992) concerning interest and motivation self-regulation, and Deci and Ryan (1985, 1991) regarding self-determined motivation, the goal of this thesis was to create and test an interest and motivation self-regulation model comprising three main components: Interest-enhancing strategies, interest, and self-determination. It was first hypothesized that when people are faced with a boring task, they will use the five following interest-enhancing strategies: Challenge enhancement, exploitation of stimulation from the physical context, introduction of variety within the task, provision of self-relevant rationales, and focused attentional involvement on the task. Second, interest-enhancing strategy use was hypothesized to be associated with interest, and interest, in turn, was hypothesized to be associated with the level of self-determination of extrinsic motivation. These relationships were also hypothesized to hold over time. That is, interest-enhancing strategy use was hypothesized to predict long term gains in interest, and long term gains in interest were hypothesized to predict long term gains in self-determination. Four studies were conducted to test the aforementioned hypotheses. Study 1 was a cross-sectional survey ($N=318$). Its goal was to provide an exploratory test of the interest and motivation self-regulation model. The goal of Study 2 ($N=434$) was to cross-validate the results obtained in Study 1, using a similar methodology. In Study 3 ($N=354$), the interest and motivation self-regulation model was tested in the context of a longitudinal survey. Questionnaire measures were obtained twice, at a 10 weeks interval. A control group was also tested at Time 2 to evaluate potential "carry-over" effects. In Study 4 ($N=120$), the interest and motivation self-regulation model was evaluated using an experimental design. Participants were randomly assigned to six experimental conditions corresponding to five experimental strategies, and to one control condition. Interest and motivation were measured repeatedly while the participants performed a boring free recall task. The results of all four studies revealed that the participants used the five proposed interest-enhancing strategies to a moderate extent. A single strategy, namely attentional involvement, was directly and positively associated with interest in all four studies. This strategy also had an indirect positive impact on self-determination, through interest. Moreover, in Studies 1, 2, and 3, challenge enhancement and provision of self-relevant rationales were indirectly associated with interest and self-determination, through the mediation of attentional involvement. In Study 4, provision of self-relevant rationales had a direct positive impact on self-determination. Introduction of variety did not relate, directly or indirectly, to interest and self-determination in any of the four studies. The results pertaining to exploitation of stimulation were inconsistent. In Studies 1 and 2, this strategy displayed a negative indirect impact on interest and motivation, through the mediation of attentional involvement. No significant associations were found in Study 3 for this strategy. In Study 4, this strategy displayed a direct positive impact on interest and self-determination. To summarize, the results offered partial support for the hypothesized interest and motivation self-regulation model. Future studies are necessary to further validate the results obtained in the present thesis. In the discussion, the importance of the study of the intrapersonal processes involved in interest and motivation self-regulation is underscored, and suggestions are made for future research on this topic. The results are also discussed in terms of their potential applied contributions.

RÉSUMÉ

L'objectif de la thèse est de créer et mettre à l'épreuve un modèle d'autorégularisation de l'intérêt et de la motivation qui s'inspire du modèle d'autorégularisation de l'intérêt proposé par Sansone et ses collègues (1992) et de la théorie de l'autodétermination (Deci & Ryan, 1985, 1991). Le modèle comprend trois éléments: les stratégies d'autorégularisation de l'intérêt, l'intérêt, et l'autodétermination. Il est proposé dans un premier temps que lorsque les gens ont à faire face à une tâche ennuyante, ils auront recours aux stratégies d'autorégularisation de l'intérêt suivantes: se créer des défis, exploiter la stimulation de l'environnement, induire de la variété dans la tâche, rationaliser, et se concentrer totalement sur la tâche. Deuxièmement, il est proposé que l'usage des stratégies d'autorégularisation de l'intérêt est associé au niveau d'intérêt. Troisièmement, il est proposé que le niveau d'intérêt est associé au niveau d'autodétermination de la motivation extrinsèque envers la tâche. Quatrièmement, il est proposé que les hypothèses précédentes sont valides à long terme. De façon plus précise, il est proposé que l'usage des stratégies d'autorégularisation de l'intérêt prédit les gains d'intérêt ultérieurs et que les gains d'intérêt prédisent les gains d'autodétermination. Quatre études ont été effectuées afin de mettre ces hypothèses à l'épreuve. L'Étude 1 est une étude par questionnaire dont le devis est de nature transversale ($N=318$). Le but de cette étude était de permettre un test préliminaire du modèle d'autorégularisation de l'intérêt et de la motivation. L'objectif de l'Étude 2 ($N=434$) était de reproduire les résultats obtenus lors de l'Étude 1, en utilisant une méthodologie identique. Lors de l'Étude 3 ($N=354$), le modèle d'autorégularisation de l'intérêt et de la motivation a été mis à l'épreuve par le biais d'un devis longitudinal. Dans le cadre de cette étude, les mesures par questionnaires ont été obtenues à deux reprises, à dix semaines d'intervalle. De plus, un groupe témoin a également été testé au Temps 2, afin d'évaluer la possibilité d'un effet contaminant du Temps 1 sur le Temps 2. Lors de l'Étude 4 ($N=120$), le modèle d'autorégularisation de l'intérêt et de la motivation a été mis à l'épreuve au moyen d'un devis de type expérimental. Les sujets ont été assignés aléatoirement à six conditions correspondant aux cinq stratégies d'autorégularisation de l'intérêt et à une condition témoin. Les niveaux d'intérêt et d'autodétermination ont été mesurés à plusieurs reprises pendant que les participants se livraient à une tâche de rappel libre ennuyeuse. Les résultats des quatre études révèlent que les participants utilisent les cinq stratégies de façon modérée lorsqu'ils ont à transiger avec une tâche ennuyante. Une seule stratégie a démontré un lien direct et positif avec l'intérêt dans le contexte des quatre études: se concentrer sur la tâche. Cette stratégie avait également un impact indirect et positif sur l'autodétermination, par le biais de l'intérêt. De plus, dans le contexte des Études 1, 2, et 3, se créer des défis et rationaliser ont eu un impact indirect et positif sur l'intérêt et l'autodétermination, par l'intermédiaire de la concentration sur la tâche. Induire de la variété dans la tâche n'a pas eu d'effet direct ou indirect sur l'intérêt et l'autodétermination dans aucune des quatre études. Les résultats relatifs à l'exploitation de la stimulation de l'environnement ne sont pas cohérents. Lors des Études 1 et 2, cette stratégie a démontré un impact indirect négatif sur l'intérêt et l'autodétermination, par le biais de la concentration sur la tâche. Lors de l'Étude 3, cette stratégie n'a fait preuve d'aucune association significative. Dans le cadre de l'Étude 4, exploiter la stimulation de l'environnement a eu un impact direct et positif sur l'intérêt et sur l'autodétermination. En somme, les résultats appuient partiellement le modèle d'autorégularisation de l'intérêt et de la motivation proposé. Des études additionnelles sont nécessaires pour conforter la validité des résultats obtenus. L'importance de l'étude des mécanismes intrapersonnels en jeu dans l'autorégularisation de l'intérêt et de la motivation est soulignée dans la discussion et des pistes de recherche futures sont proposées. Les résultats sont également interprétés en fonction de leurs implications potentielles au niveau appliqué.

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CHAPTER ONE

INTRODUCTION

Statement of the Problem

Boredom is a disagreeable experience. It can range from mild unpleasantness to debilitating mental numbness, or painful frustration. Boredom entails negative consequences that vary in their severity. The negative feelings associated with the experience of boredom generate discomfort, and can lead to motivational problems, performance deficits, and even psychological disorders. Suffice it to say, boredom is an aversive experience we could easily do without. Conversely, interest is an enjoyable experience that has been associated with a host of positive consequences such as greater perceived competence, freedom, and positive emotions (Deci, 1992). Further, interest is a powerful motivator and a key component in intrinsic motivation and self-determination (Deci & Ryan, 1985, 1991; Reeve, 1989). In sum, while interest is a desirable state, boredom is dysfunctional and must be alleviated. Unfortunately, boring activities are not always avoidable. But is boredom inevitable?

Identifying proximal antecedents of boredom and interest has been a popular topic in motivational research. Overall, research in this field has focused primarily on the influence of the social environment in altering interest and motivation. For instance, past research revealed that competence-promoting information (Boggiano & Ruble, 1979) and structure (Harackiewicz, Abrahams, & Wageman, 1987) enhanced interest and motivation. Conversely, information that implied or provoked incompetence (Vallerand & Reid, 1984), as well as monetary rewards (Deci, 1975), and competition (Deci, Betley, Kahle, Abrams, & Porac, 1981), have been shown to reduce interest and motivation. Thus, the influence of interpersonal factors on interest and motivation has been fairly well documented. Yet, one can

ask: Are peoples' levels of interest and motivation solely at the mercy of environmental factors? Or can individuals play an active role in managing their interest and motivation?

Indeed, studies in the field of interest and motivation self-regulation suggest that it might be possible for individuals to actively transcend boredom (Hamilton, Haier, & Buschbaum, 1984; Sansone, Weir, Harpster, & Morgan, 1992). Shifting the focus from the interpersonal to the intrapersonal context, as well as looking at how interest and motivation are generated when they are lacking, provides a novel perspective for the study of interest and motivation. On the basis of the works of Sansone and her colleagues (1992) regarding interest and motivation self-regulation, and Deci & Ryan (1985) on self-determined motivation, the goal of the present thesis is to build and test a model of interest and motivation self-regulation.

Sansone and her colleagues (1992) designed an innovative model of interest and motivation self-regulation based on interest-enhancing strategy use. Although the interest-enhancement component of this model is theoretically well developed, the motivational component has been somewhat neglected. That is, no theoretical propositions are offered regarding the nature of motivation and the stages of its evolution. In contrast, Deci and Ryan's self-determination theory (1985, 1991) provides detailed theoretical postulates regarding motivation and its evolution. However, the intrapersonnel processes underlying self-determination internalization, a key component of this theory, have been, by and large, overlooked. The study of interest-enhancing strategy use might yield useful insight with respect to this issue. In the present thesis, the theories proposed by Deci and Ryan (1985, 1991), and by Sansone and her colleagues (1992), are perceived as complementary and are studied jointly in the hope of gaining a better understanding of interest and motivation self-regulation. Specifically, a series of studies have been designed to investigate the interrelations between interest-enhancing strategies, interest, and self-determined motivation.

This thesis comprises six chapters. Chapter 1 presents the theoretical underpinnings of the research project. This chapter reviews the literature pertaining to boredom, interest, and interest and motivation self-regulation. Special attention is paid to the works of Sansone and her colleagues (1992) on interest and motivation self-regulation, and of Deci and Ryan (1985, 1991), on self-determined motivation. Throughout this chapter, those concepts and issues which are most central to the goals and hypotheses of the present thesis are underscored. The following four chapters describe four full-scale studies performed on independent samples, and using a variety of research designs. Chapter 2 presents the first study. The goal of this study was to provide a first test of the hypothesized interest and motivation self-regulation model, using a cross-sectional design. The purpose of the second study, described in Chapter 3, was to replicate the results obtained in the first study, that is, to cross-validate the interest and motivation self-regulation model. Chapter 4 reports the results of the third study. In this study, the interest and motivation self-regulation model was tested using a longitudinal design. The goal of this study was to provide temporal support for the causal sequence of the model. Chapter 5 describes the fourth and final study of the thesis. In this study, the interrelations between interest-enhancing strategies, interest, and motivation, are assessed in the context of an experimental design. Finally, in Chapter 6, the results of all four studies are compared and discussed. The issues addressed in this chapter include: limitations of the present research project, theoretical and applied implications of the research results, and suggestions for future research pertaining to self-influence in the regulation of interest and motivation.

BOREDOM AND INTEREST

Boredom

Boredom is a feeling which is familiar to all of us. It is an aversive and counter-productive experience which can be quite an impediment at times. Such a widely-experienced and troublesome phenomenon is likely to support interesting theoretical, empirical and applied investigations. Yet, until recently, boredom is a topic which has been under-represented in the psychological literature. Smith (1981) reports that, between 1926 and 1981 (55 years!), 40 articles were published on boredom: Less than one paper per year! Nevertheless, these precious few articles provided a basis for the study of boredom, and this field has become increasingly popular over the last fifteen years. The following paragraphs briefly outline the main directions within the evolution of the study of boredom.

Boredom was first examined by psychoanalysts and industrial psychologists. Psychoanalysts regard boredom as a conflict between the ego and the id (Bernstein, 1975; Esman, 1979; Fenichel, 1951; Greenson, 1953; Wangh, 1975; Weinberger & Muller, 1974). For example, Fenichel (1951) argues that boredom results from the repression of drive-aims, both in their real and displaced forms. When an individual simultaneously craves a drive-object and suppresses his or her drive, tension is created and boredom ensues. The incompatible demands from the ego and the id engender a hopeless state of expectation, which is experienced as boredom. Albeit interesting, the psychoanalytical theory of boredom is highly speculative and irrefutable. Its relevance to the present discussion falls within historical considerations.

Works within the field of industrial psychology have adopted a more pragmatic approach to boredom. Within this perspective, authors are mostly concerned with monotony and boredom associated with repetitive or tedious tasks, such as mechanical assembly

(Barmack, 1937, 1938, 1939a, 1939b; Murrell, 1971; Smith, 1953, 1955, 1966; Scott, 1966), and with boredom-related performance deficits in vigilance tasks (Wyatt & Landon, 1932), such as industrial inspection, driving, or airport traffic control (see Davies & Tune, 1970; Mackie, 1977 ; or Mackworth, 1969, for literature reviews).

The works described above provided the basis for current boredom research and theory. Today, boredom is most often defined as an unpleasant experiential state provoked by prolonged exposure to monotonous stimulation and characterized by aversion toward the monotonous elements of the situation, and by a need to escape them (Mikulas & Vodanovich, 1993; O'Hanlon, 1981). Boredom is generally thought to result from a mismatch between the individual's optimal state of arousal and the stimulation available in the boring environment (Berlyne, 1960; Csikszentmihalyi, 1975, 1982; Fiske & Maddi, 1961; Hebb, 1955; Zuckerman, 1969).

Authors generally agree that boredom results from the interaction between an individual and a situation (e.g., Larson & Richards, 1991). However, the bored individual's characteristics and the boring environment's characteristics constitute two distinct foci of boredom research.

Situational boredom is thought of as a transient, temporary, and unstable state (see Mikulas & Vodanovich, 1993, and O'Hanlon, 1981, for literature reviews). It is hypothesized to result from deficit in stimulus characteristics such as novelty, surprise, ambiguity, complexity, intensity, variability, and meaningfulness (Berlyne, 1960; Fiske & Maddi, 1961). Situational boredom is thought to be easily reversible (O'Hanlon, 1981).

Conversely, *individual boredom* is conceptualized as a personality trait (see De Chenne & Moody, 1988, Hamilton, 1981, and Smith, 1981, for literature reviews). Individual boredom refers to personal dissatisfaction with respect to the stimulation provided by a particular activity. As such, once acquired, personal boredom is considered a stable

feature which is difficult to change. This problem has been addressed by clinicians (e.g., Burte & Araoz, 1988; De Chenne & Moody, 1988) and educational psychologists (e.g., Robinson, 1975; Wasson, 1981). Also, several personality characteristics have been related to individual boredom susceptibility. The most frequently mentioned are extroversion (Hill, 1975; Hill & Perkins, 1985), sensation-seeking (Zuckerman, 1979), and intelligence (Geiwits, 1966; Schultz & Schultz, 1986).

Interest

Interest is thought to be the antithesis of boredom. Yet, interest and boredom have this in common: literature on both topics is relatively underdeveloped. Interest once was a popular topic (see Arnold, 1906, for an early 20th century review of the literature on interest). Phenomenological aspects of interest inspired philosophers (e.g., James, 1912), and the assumed relationship between interest and learning underlaid the formulation of early mainstream educational theories such as those proposed by Dewey (1913), and Thorndike (1935). However, the initial burst of interest in "interest" dwindled over the years, possibly as the result of the growing influence of behaviorism (Krapp, Hidi, & Renninger, 1992). This trend has quite recently reversed itself. There has been a growing number of research endeavors related to the influence of interest on learning and development over the last fifteen years (see Hidi, 1990, Krapp et al., 1992, Schiefele, 1992, for literature reviews). As if to make up for lost time, interest in "interest" is resurfacing with gusto. Interest is a compelling theoretical theme. Its inherent experiential and motivational qualities bestow interest with promising potential as an explanatory construct. Recent developments in interest literature form the foundation of the present thesis. As such, special consideration has been devoted to these works, which are presented in a following section: "Interest and Motivation Self-

Regulation". For the time being, attention is focused towards leading conceptual definitions of the interest phenomenon.

Interest is thought to be an experiential state characterized by focused and effortless attention, and accompanied by feelings of pleasure and concentration (Krapp et al., 1992). According to Csiztenkmihalyi (1975, 1982), interest is attained in "flow", a state which results from optimal stimulation. Optimal stimulation occurs when a task's level of difficulty and an individual's level of ability are perfectly balanced. If the individual's capabilities to handle the task are insufficient, the individual experiences anxiety. Conversely, if a task's level of difficulty is insufficient to keep an individual optimally challenged, the individual experiences boredom. When an individual is optimally challenged and stimulated, "flow" and interest naturally occur. According to Deci (1992), the exploratory behavior of children is the prototype of interest behaviors. Such interest is "pure" because it is not yet compelled to coexist with other motivational forces such as evaluation apprehension, ego-involvement, social comparison, or habit.

Like boredom, interest is generally thought to occur within the interaction between an individual and his or her environment (Deci, 1992; Hidi & Baird, 1986, 1988; Krapp et al., 1992). However, a distinction is generally made between interest as an environmental characteristic, and interest as a personal disposition. A parallel can be established with boredom literature. Boredom research focused on situational and personal boredom. Likewise, situational interest and personal interest reflect two general tendencies of the interest literature (Hidi, 1990; Hidi & Anderson, 1992; Krapp et al., 1992; Schiefele, Krapp, & Winteler, 1992).

Situational interest results from certain stimulus attributes which are surmised to produce a similar experiential state amongst most individuals. Specifically, situational interest is hypothesized to result from the presence of stimulus characteristics such as novelty,

surprise, ambiguity, complexity, intensity, variability, and meaningfulness (Berlyne, 1960; Fiske & Maddi, 1961). Because of its reliance on environmental qualities, situational interest is deemed to have mainly short-term effects, and its impact on the individual's knowledge and reference system is considered limited (Krapp et al., 1992).

Personal interest is thought to be specific to the individual and is relatively stable over time. It is often associated with increased knowledge, positive emotions, and increased reference value (Krapp et al., 1992). Studies in this area are concerned with classes of interest targets which have been incorporated within a person's reference value system, that is, one's self-concept. Widespread applications are found in domains such as vocational counseling (e.g., Holland, 1985; Walsh & Osipow, 1986). Thus, interest levels towards different activities can be conceptualized as stable personality characteristics.

From Boredom to Interest

Although boredom and interest have often been studied independently, it is intuitively obvious that these are not independent concepts. Boredom and interest are merely labels describing different levels of a unique dimension. Boredom and lack of interest are synonyms. It has been said that boredom and interest can be conceptualized from a situational or a personal point of view. Situational boredom and interest stem from environmental features that produce similar short-term effects in most individuals. Conversely, personal boredom and interest are relatively stable traits that can vary significantly across individuals. Here is one of the central questions addressed in the present thesis: Can situational or personal boredom evolve into personal interest? That is, is it possible for some individuals to transcend boredom? If so, how do they do it? What drives a person to attempt boredom-coping and interest-enhancement? It is argued here that the study of interest and motivation self-regulation can offer some answers to these questions.

INTEREST AND MOTIVATION SELF-REGULATION

Interest and motivation self-regulation were most often mentioned by authors involved in self-regulated learning research (e.g., Baird & White, 1982; Zimmerman, 1985; Zimmerman & Pons, 1986). Although the importance of interest and motivation are often stressed in these works, the main focus generally is on the impact of the self-imposed use of learning strategies such as mnemonic techniques. Self-regulated learning has been related to greater interest, enhanced motivation, longer persistence in academic tasks, and better academic achievement and performance (see McCombs & Whisler, 1989, for a literature review). The autonomous management of interest and motivation is generally deemed to be the mediating variable leading to such positive consequences (e.g., McCombs, 1984). It has also been reported that some individuals appear able to experience interest under boring circumstances (Hamilton, 1983a, 1983b; Hamilton et al., 1984). Yet, the higher level mechanisms responsible for the autonomous management of interest are at best unclear. There has been very little investigation of the processes underlying interest self-regulation. To our knowledge, the only existing article on this topic has been contributed by Sansone and her colleagues (1992).

These authors proposed a model, based on the use of interest-enhancing strategies, which describes how individuals regulate their motivation to perform boring activities. According to Sansone and her colleagues (1992), when a task is uninteresting and when its performance is deemed necessary, people are likely to use interest-enhancing strategies. Interest-enhancing strategy use is, in turn, theorized to induce gains in interest and motivation. Thus, as a potential interest and motivation self-regulation mechanism, interest-enhancing strategies are a focal point of the present thesis.

Sansone and her colleagues (1992) identified three interest-enhancing strategies: (1) challenge enhancement, (2) exploitation of residual stimulation from the physical context, and

(3) introduction of variety within the task. Two additional interest-enhancing strategies are also considered in the context of the present thesis: (4) provision of self-relevant rationales for performing the activity, and (5) focused involvement of attention on the target task. The following sections review the literature providing theoretical or empirical support for each of the proposed strategies.

Interest-Enhancing Strategies

Challenge Enhancement

Mainstream motivational theories generally assume that actions which enhance challenge and competence induce interest (Bandura, 1977, 1982, 1989, 1991; deCharms, 1968; Csikszentmihalyi, 1975, 1982, 1993; Deci, 1975, 1980; Deci & Ryan, 1985, 1991; White, 1959). It is the opportunity for gains in competence, effectance, or mastery feelings which engender interest. Thus, challenge heightens interest by providing a test for the individual's competence. It is believed that this effect is best obtained when the level of challenge is optimal (Bandura & Schunk, 1981; Csikszentmihalyi, 1975, 1982; Deci & Ryan, 1985, 1991).

Under intrinsic circumstances¹, people display a natural inclination for tasks which are slightly above their current level of ability (Danner & Lonky, 1981; Deci, 1975). Harter (1978) has shown that the relationship between task difficulty and pleasure is best described by a curvilinear model. Specifically, pleasure initially appears to increase with task difficulty. However, pleasure seems to decrease when the task exceeds the individual's abilities. In

¹ Intrinsic and extrinsic motivation will be thoroughly discussed in a following section: "Self-Determination Theory". For the time being, it is sufficient to say that intrinsic motivation refers to activities performed out of pleasure, and extrinsic motivation to activities performed for instrumental purposes.

Harter's (1978) view, optimally challenging tasks are defined as being relatively difficult in order to provide the greatest possible sense of competence and satisfaction when they are solved. Csikszentmihalyi (1975, 1982) proposed a model of optimal experience where optimal challenge is the core construct. Optimal experience results from an ordered state of consciousness. Since consciousness tends to become disorganized if the informational input is either exceedingly simple or complex, optimal experience stems from optimal challenge. Optimal challenge occurs when one's capabilities best match the difficulty of the activity. If one's skills exceed the challenge provided by the activity, one will experience boredom. Conversely, if the challenge is too high for one's abilities, one will experience anxiety. Balance between the individual's skills and action opportunities creates informational flow, hence optimal experience.

The previous discussion outlines actual theoretical and empirical contributions which endorse the notion that challenge fosters interest. This effect is hypothesized to be at its peak when the challenge is optimal. Moreover, the preference for optimal challenge appears to occur naturally when one is intrinsically motivated. However, the nature of the relationship between challenge and interest under extrinsic circumstances has yet to be thoroughly explored. Past research indicates that the preference for optimally challenging situations decreases when the individual is offered extrinsic reasons to perform a task (Boggiano, Main, & Katz, 1988; Harter, 1974, 1978; Maehr & Stalling, 1972; Shapira, 1976). When the goal of the behavior is purely instrumental, there is little reason to voluntarily raise the level of difficulty. If the focus is on obtaining rewards or avoiding punishments, one's best course of action is to minimize the risks of failure. It is unfortunate that this is seemingly accomplished at the expense of intrinsic interest and enjoyment, particularly since the preference for challenge is associated with a tendency to persist over time, once the extrinsic incentives are removed (Pittman, Emery & Boggiano, 1982). However, there is some evidence indicating that preference for challenge

can be retained in certain cases. A study by Boggiano and colleagues (1988) reports that children with high perceptions of internal control and competence retain or increase their interest in mastery pursuits under adverse conditions. Also, Csikszentmihalyi (1982) found evidence of "flow", which is the experiential counterpart of optimal challenge, in a variety of intrinsic and extrinsic settings. Thus, it appears that the adverse effect of extrinsic pressures on preference for optimal challenge is sometimes countered. How is this accomplished?

Sansone and her colleagues (1992) demonstrated in a laboratory experiment that individuals faced with a boring task used self-imposed challenge as an interest-enhancing strategy. Moreover, Bandura and Schunk (1981) demonstrated that the self-imposed use of proximal subgoals had a significant impact on perceived competence and interest related to a previously boring task. Attainable subgoals fostered the development of perceived personal efficacy, which, in turn, created self-motivation and heightened interest. In line with these research findings, it is hypothesized in the context of the present thesis that people have the ability to influence their own interest levels by deliberately creating optimal challenges for themselves through the use of proximal goal setting. For example, a student who aims to accomplish a set amount of work in a set amount of time is utilizing a proximal subgoal to challenge himself or herself.

Exploitation of Stimulation from the Physical Context

Low stimuli levels are generally deemed boring by the standards of both naive and scientific theories (Berlyne, 1960; Csikszentmihalyi, 1982; Suedfeld, 1981). It is common knowledge that it is quite boring when not much happens. From a more scientific point of view, lack of stimulation is hypothesized to physiologically induce discomfort. However, scientists have yet to reach an agreement regarding the processes causing this discomfort. Authors such as Hebb (1955) or Fiske and Maddi (1961) argue that low stimuli levels result in

unpleasant low activation (boredom). However, other authors (Berlyne, 1960; Csikszentmihalyi, 1977; Lindsley, 1961) posit that exceedingly low stimuli levels create unpleasant high arousal (boredom). From a pragmatic point of view, this controversy is of little importance since increasing stimuli levels is likely to solve the problem regardless of its source. Theories of sensoristasis (Schultz, 1965) and optimal level of stimulation (Zuckerman, 1969) postulate that there is an ideal range of stimulation, and that deviations from this range causes the organism to seek ways to remedy the situation. According to Suedfeld (1981), this can be accomplished by producing actual stimulation in any of the sensory modalities, and by exploiting residual stimulation in the environment more effectively. Daydreaming, listening to music, talking to oneself, and eating or drinking are instances of better stimuli exploitation. Suedfeld (1981) believes that, by using such strategies, individuals are able to maintain optimal levels of stimulation through their own efforts when they are faced with a boring situation.

In their laboratory experiment, Sansone and her colleagues (1992) demonstrated that participants tend to attend to stimuli from the physical context when they are faced with a boring task. Since there is extensive evidence that low stimulation (boredom) produces motivation for increased stimulation ("stimulus hunger"; e.g., Scott, Bexton, Heron, & Doane, 1959; Leckart, Levine, Goscinski, & Brayman, 1970), it is hypothesized, in accordance with Sansone and her colleagues (1992), that individuals faced with an unavoidable boring task will turn to environmental stimuli as a means of increasing overall task interest. A student who listens to music and drinks pop while studying is engaging in exploitation of environmental stimuli.

Introduction of Variety Within the Task

Aside from stimulus magnitude, stimulus characteristics such as stimulus predictability and stimulus pattern are hypothesized to affect physiological and psychological activation

(Berlyne, 1960, 1974; Fiske & Maddi, 1971; Hackman & Oldman, 1976). For instance, monotonous repetition of even a complex task can become quite tedious (Scott, 1966). The most extensive exploration of interest enhancing stimulus characteristics was performed by Berlyne (1960, 1974). According to this author, stimulus characteristics such as novelty, surprise, ambiguity, and complexity create "epistemic curiosity" (i.e., the need to interact with the stimulus to understand it better, which is often equated with interest). Novelty, surprise, ambiguity, and complexity are said to induce collation, that is, cognitive processing through the creation of relationships both within the informational elements being processed and between the new information and past information. Collation would proceed through comparison and synthesis. Its goal is congruence within neural processes (Berlyne, 1971). Collative variables (novelty, surprise, ambiguity, and complexity) create a state of physiological arousal which mediates the exploratory behavior intended to produce collation.

Berlyne's work focuses on task characteristics which are likely to create interest. However, one can adopt a conceptually reversed framework in an attempt to study boredom provoking characteristics. Studies in the area of alternation behavior (Montgomery, 1953; Tolman, 1925), stimulus change seeking (Garlington & Shimota, 1964; Kiviy, Earl, & Walker, 1956), novelty seeking (McReynolds, 1962), and sensation seeking (Zuckerman, 1971, 1974, 1978, 1979), all addressed the issue of stimulus satiation (Glanzer, 1953). Overall, these theories posit that the familiarity of a given set of stimuli substantially decreases its arousing properties, which will cause the organism to act to correct the situation (Voss & Keller, 1983). For instance, Fiske & Maddi (1971) argued that higher organisms possess a "need for varied experience" which is stifled by underactivation and repetition. Consequent boredom is said to prompt the individual to look for new experiences.

Temporary withdrawal from the stimuli set has been proposed as an alternative to quitting altogether (Scott, 1966). This strategy is said to restore the activity's potential to create

activation. Planned stimuli change could also be helpful in keeping activation at near-optimal levels. Findings from Hackman and Oldman (1976) indicate that job rotation keeps work motivation reasonably high. Also, Sansone and her colleagues (1992) discovered that participants faced with a boring task varied the procedure to heighten their interest. Based on the previously mentioned findings, it is hypothesized that, by varying the methods utilized to perform a task, by alternating between different parts of a same task, or by alternating between different tasks, individuals can self-regulate their levels of interest and their motivation. A student who alternates between reading, summarizing, and memorizing subsections of test material would be creating variety to enhance his or her interest.

Provision of Self-Relevant Rationales

The motivational properties of long-term goals and personal values have long been known (e.g., Latham & Locke, 1991; McClelland, 1985; Showers & Cantor, 1985; Deci & Ryan, 1985). Although goals and values often coexist with intrinsic activities, their impact is most important with respect to extrinsic situations. Since extrinsic tasks are essentially aversive, they would obviously not be performed without a valid reason. The crux of the issue is: How do goals and values affect interest and motivation? Is the effect qualitative or merely quantitative?

On a quantitative basis, the appeal of the coveted goal, as long as it outweighs the aversive aspects of the task, is probably sufficient to produce the extrinsic behavior. However, the literature pertaining to the impact of internal versus external rewards warns us about the deleterious influence of external constraints (See Deci & Ryan, 1985, 1987, Boggiano & al., 1988, for literature reviews). Conversely, internal rewards appear to be strongly related to positive outcomes. For instance, congruity of the goals and values underlying one's behavior with one's self-concept correlates with high levels of interest and self-determination (Deci,

1992; Deci & Ryan, 1985, 1991). Moreover, the extent of personal endorsement and responsibility with respect to one's goals and values has been related to mood and motivation self-control (Showers & Cantor, 1985). The potential for interest-enhancing capabilities of self-relevant rationales is further supported by the finding that personal relevance actually increases perceived interest (Rogers, Kuiper, & Kirker, 1977; Schmeck & Meier, 1984). Also, possible selves theory (Markus & Nurius, 1986; Markus & Ruvolo, 1990) contends that the self-system generates positive possible selves which serve to energize and organize action. This serves to increase motivation by personalizing it. Baumeister and his colleagues (Baumeister, Heatherton, & Tice, 1994) argue that the exercise of transcendence is essential to self-regulation. According to these authors, transcendence allows people to respond to meaningful distal goals and standards, rather than to the unpleasant stimuli related to the situation that requires self-regulation.

Interestingly, Sansone and her colleagues (1992) did not consider the provision of a substantive rationale as a potential interest-enhancing strategy, although they actually included such a rationale in one of their studies to ensure participants' engagement in the boring experimental task. Specifically, the researchers led the participants to believe that the completion of an experimental task was good for their health. Individuals provided with a health-related rationale used more interest-enhancing strategies. This offers indirect support to the interest-enhancing properties of self-relevant rationales.

On the premise of these considerations and findings, it is hypothesized that interest and motivation enhancement can be achieved through the self-provision of self-relevant rationales. The closer the rationale to one's own values and motives, the better it is postulated to contribute to interest-enhancement. It is argued here that, by identifying and thinking over personal goals and values, individuals can self-regulate their interest and motivation. For example, a student could regularly remind himself or herself of his or her desire to become a knowledgeable and

helpful psychologist while studying assessment techniques. By doing so, the student is actively relating to a personally relevant rationale to increase his or her interest toward assessment techniques.

Focused Attentional Involvement in Task Accomplishment

Focused attentional involvement in task accomplishment is the final factor which is hypothesized to induce interest-enhancement. This assumption is first derived from works on the correlates of interest. Hidi (1990), and Hidi and Anderson (1992), contend that interest creates spontaneous allocation of attention. According to Deci (1992), interest is characterized by spontaneous concentration and engagement. Moreover, Csikszentmihalyi (1975, 1982) posits that "flow", the optimal state of interest, results from the merging of action and awareness. "Flow" creates a state of total concentration where all irrelevant thoughts and feelings are banned from consciousness. Since concentration appears to emerge naturally in intrinsically interesting activities, it is surmised that the deliberate regulation of one's level of concentration toward a less-interesting task could lead to increases in interest. This proposition is supported by a number of previous works.

Corno and Mandinach (1983) suggested that cognitive engagement was an essential component of academic motivation. Likewise, Entwisle and Ramsden (1983) related student's preferred learning style to interest. These authors differentiated between deep-processing learning strategies and surface-level learning strategies. Students oriented towards deep-processing strategies prefer to establish relationships between elements of the learning material, identify inconsistencies, and attempt to resolve them. They also like to view the material from different conceptual angles. Students oriented towards surface-level strategies prefer memorization tasks. Interest-oriented learning correlated with the deep-processing learning

orientation (Entwistle & Ramsden, 1983; Nolen, 1988). Higher concentration thus appears to be related to higher interest and motivation. Why?

In her article, Fisher (1993) postulated that when one forces oneself to attend to a task, regardless of one's feelings towards the task, forced attention will be necessary only at the onset of the activity. Provided that the task's level of complexity is sufficient, the performer will become absorbed after a short period of effort because he or she will need concentration to adequately perform the task. Hamilton's (1981) attentional regulation model goes further. In her view, people's attentional capacity at a particular moment is fixed. If the person's attentional capacity exceeds the information provided by the environment, the spare attentional capacity will be focused on task-irrelevant thoughts and on self-monitoring of one's experience. Feelings of boredom and a perception that time is passing slowly would ensue. Thus, according to Hamilton (1981), spare attention can be redirected by increasing one's involvement with the task. Rerouting attention allows the avoidance of boredom and subsequently creates interest. Proper attentional regulation leads to absorbing interest and "flow" while improper attentional regulation breeds boredom. Hamilton's hypotheses are indirectly corroborated by works on thought suppression (e.g., Wegner, 1992). Wegner (1989, 1992; Wegner & Erber, 1993) proposes a model where attempts to suppress unwanted thoughts (e.g., "This is really boring!") are hypothesized to backfire because they create an inescapable feedback loop. The intention of suppressing the thought causes one to check if the thought has indeed been suppressed, which prompts the unwanted thought back. Wegner (1992) posits that the only way to break this cycle is to immerse oneself in an activity requiring the totality of one's attentional capabilities.

In short, when you really get involved in what you are doing, you don't have any attentional energy left to feel bored. Moreover, the actual experience of being totally immersed in an activity is considered rewarding (Csikszentmihalyi, 1975, 1982). In our view, the above

evidence provides sufficient grounds to hypothesize that focused attentional involvement in task accomplishment can contribute to the enhancement of interest and motivation. For example, a student could focus on the few aspects of an overall monotonous task that interest him or her in order to perform the less-interesting aspects of the task. Specifically, an undergraduate psychology student required to memorize a long list of benzodiazepines could focus on the effect of each drug on the brain, if this aspect of neurophysiological science appeals to him or her. Although more work is involved, this strategy might make memorization more efficient and more pleasurable.

Interest-Enhancing Strategy Use, Interest, and Motivation

In agreement with Sansone and her colleagues (1992), and on the basis of the literature reviewed in the sections above, it is argued here that, when people are faced with an uninteresting task, they will resort to interest-enhancing strategies. Interest-enhancing strategy use, in turn, is said to have a beneficial impact on interest and motivation. However, an important question remains unanswered: How is this accomplished?

According to Sansone and her colleagues (1992), individuals possess cognitive schemas, named "activity definition", in which their knowledge concerning a particular task and its characteristics are stored. Judgments relevant to the perceived interest of the task are part of the activity definition. The cornerstone of motivation enhancement is the hypothesized flexibility of activity definition. When a task is uninteresting and when its performance is necessary, individuals are likely to get involved in interest-enhancing procedures. Interest-enhancing strategy use, in the long run, leads to the psychological and physical transformation of the activity definition. Over time, when one engages regularly in interest-enhancing

strategies while performing a particular activity, the definition of the activity changes to accommodate the novel and more positive information yielded by interest-enhancement.

Sansone and her colleagues (1992) performed a series of three studies designed to test their model. Study 1 revealed that participants possessed implicit knowledge about interest-enhancing strategies, as well as knowledge about the circumstances under which these strategies can be applied. Hence, participants manifested both declarative and procedural knowledge pertaining to interest-enhancing strategies. Study 2, in turn, showed that individuals engaged in interest-enhancing strategies mainly when the experimental task was uninteresting, and when they had a good reason for doing the task. Thus, the strategies identified in Study 1 would not be implemented unless the task was actually boring, and unless its performance was deemed important. Moreover, strategy use was associated with greater likelihood of subsequent voluntary task performance. This finding supported the notion that strategy use actually influenced activity definition and subsequent interest and motivation towards the activity. Finally, Study 3 evaluated peoples' beliefs regarding the efficacy of interest-enhancing strategies. Indeed, participants believed that interest self-regulation played an important role in the maintenance of motivation in the three activities that were investigated (i.e., listening to music, exercising, and reading). Overall, Sansone and her colleagues (1992) contend that the results from their three studies provide support for their model by demonstrating that certain behaviors yield intentional interest-enhancing strategy use.

Sansone and her colleagues (1992) offer a plausible model of interest and motivation enhancement. It seems possible for interest-enhancing strategy use to yield interest-enhancement, and for interest-enhancement, in turn, to lead to motivational changes. However, Sansone and her colleagues (1992) focused mainly on issues directly related to interest self-regulation, and the motivational component of the model appears underdeveloped. It is argued here that it is essential to further investigate motivational issues because these

issues could provide answers to fundamental problems within the model proposed by Sansone and her colleagues (1992). This model provides insight into the mechanisms explaining *how* people can possibly transcend boredom. Yet, a fundamental question is left unanswered: *Why* do they do it? What prompts people to modify their levels of interest and motivation? Is the goal purely to make the boring event less aversive? If so, why does interest-enhancing strategy use induce changes in interest and motivation which outlast the performance of the boring activity? If people were simply interested in coping with the unpleasantness associated with boredom, they could use interest-enhancement temporarily and be done with it. Are stable gains in interest and motivation merely coincidental? Or do they serve a higher purpose? What would it be? Framing interest-enhancement within a well articulated motivational theory could provide some answers to these basic questions. Deci and Ryan's self-determination theory (1985, 1991) is presented below, in the hope that it will be helpful in achieving this goal.

Self-Determination Theory

Deci and Ryan's (1985, 1991) self-determination theory posits different types of motivation which are characterized by the level of self-determination that underlies behavior. These motivational types are divided in three broad categories: Intrinsic motivation, extrinsic motivation, and amotivation.

Intrinsic Motivation

Intrinsic motivation refers to the propensity to engage in an activity for the pleasure and satisfaction inherent to activity performance (Deci, 1975). A person is said to be intrinsically motivated when she performs an activity out of personal volition, because it appeals to her. Intrinsic motivation is thought to stem from people's innate need for competence and self-

determination (Deci, 1975; Deci & Ryan, 1985). These feelings constitute the spontaneous gratification which is the source of activity performance. Engaging in the activity thus becomes an end in itself, that is, an intrinsic purpose. However, because people seldom perform boring activities for pleasure motives, little consideration is devoted to intrinsic motivation in the present thesis. Alternatively, attention is focused on extrinsic motives.

Extrinsic Motivation

Extrinsic motivation underlies instrumental behaviors. An extrinsically motivated person is not interested in the activity per se. The activity is performed to prompt agreeable consequences or to avoid disagreeable ones (Deci, 1975). Extrinsic behaviors are not pleasurable to perform: They are a means to an end. Traditionally, extrinsic motivation solely referred to non-autonomous behaviors, that is, behaviors brought about by sources of control residing outside the person. However, it is important to realize that extrinsic motivation does not systematically preclude personal freedom. Extrinsic behaviors can be reluctantly performed out of external pressure, or freely undertaken out of personal choice. Albeit always instrumental, extrinsic behaviors vary to the extent that they are perceived as constrained by external contingencies, or as freely endorsed by oneself. Thus, extrinsic subtypes involving different degrees of self-regulation were recently proposed by Deci, Ryan, and their colleagues (Deci & Ryan, 1985; Ryan & Connell, 1989; Ryan, Connell, & Deci, 1985; Ryan, Connell, & Grolnick, 1990). These subtypes form a continuum where they are defined in terms of their implied degree of self-determination. Ranging from low to high self-determination, these subtypes are: external regulation, introjected regulation, identified regulation, and integrated regulation.

External regulation. This type of behavioral regulation corresponds to the most commonly accepted definition of extrinsic motivation. The externally regulated behavior is

totally governed by outward sources of control. It is performed for the sole purpose of responding to environmental contingencies.

Introjected regulation. When behavioral regulation is introjected, the control stems from within the person in the form of self-imposed pressure or emotions related to self-esteem (e.g., guilt or anxiety). Compared to external regulation, introjected regulation is an improvement in self-determination because the regulation of behavior comes from within. Yet, this form of motivation cannot be considered self-determined because behavioral regulation stems from external constraints which have been internalized. The activity is not freely chosen since the person acts to avoid a self-imposed unpleasant emotional consequence.

Identified regulation. When a behavior gains enough importance to be valorized in and of itself by the individual, it becomes regulated through identification. The internalization of external motives is then sufficient to cause the individual to identify with the activity. Behavior is thus freely undertaken. It is performed as a result of being personally valued.

Integrated regulation. Finally, when integration of regulation occurs, the identification with ones' motives has reached a high level of generality within the self-system, and the behavior is included in the person's self-definition. Over and above being valued in itself, the behavior is in accordance with the person's self-system. The behavior is a reflection of the person's identity.

Amotivation

Amotivation is a state wherein the person fails to perceive a relationship between his or her actions and subsequent results (Deci, 1975). Thus, the amotivated individual is incapable of foreseeing the consequences of his behavior. He is therefore unable to perceive the motives underlying it. The amotivated person is overwhelmed by a pervasive sense that his or her behaviors are caused by forces beyond his or her control. Amotivated actions are mechanical

and dispirited, and the person is likely to give them up eventually. Amotivation is an experience of lack of control and alienation which is akin to learned helplessness (Abramson, Seligman, & Teasdale, 1978).

Self-Determination Continuum

According to Deci and Ryan (1985), the different motivational types and subtypes coexist on a unidimensional continuum representing self-determination. Therefore, the essential difference between these motivational constructs is the implied level of self-determination. Intrinsic motivation represents the height in self-determination because it underlies the regulation of freely chosen pleasurable behaviors. Amotivation depicts the absence of free-will and motivation, and thus delineates the lowest pole of the continuum. The extrinsic subtypes lie between these two poles. Extrinsic behaviors, regardless of their level of self-determination, are performed for instrumental reasons. However, personal involvement and perceived freedom are hypothesized to increase as behavior regulation becomes more self-determined. Introjected regulation is said to be more self-determined than external regulation because external pressures have been internalized in the form of personal feelings such as guilt or anxiety. With respect to introjected regulation, identified regulation is considered an improvement in self-determination because valuing the behavioral outcome is likely to alleviate pressure and foster free choice. Finally, integrated regulation is said to express the highest level of self-determination for extrinsic behaviors because inclusion of the behavior in the person's self-definition is thought to be the ultimate way to alleviate the conflict between behavior unpleasantness and behavior performance. A schematic illustration of the self-determination continuum is presented in Figure 1.

The motivational taxonomy proposed by Deci and Ryan (1985, 1991) has received extensive support for its validity in a host of different domains. The motivational constructs

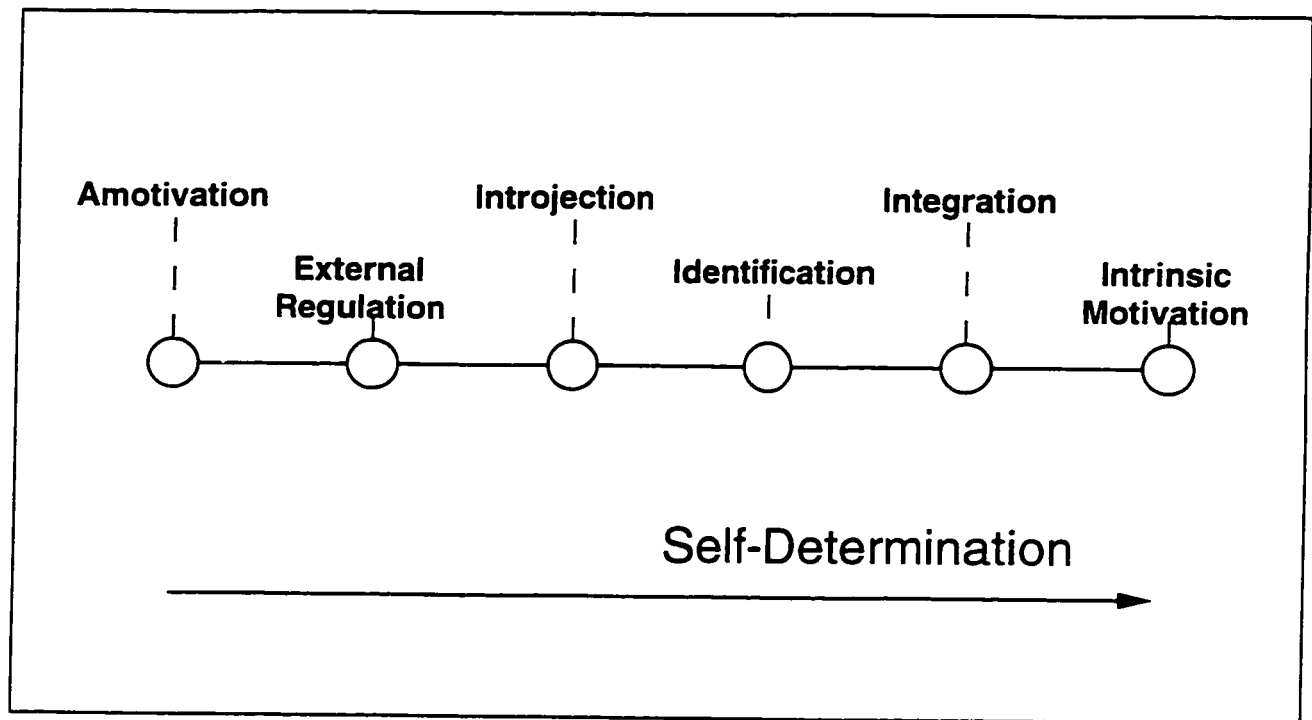


Figure 1. Self-Determination Continuum (Deci & Ryan, 1985)

composing the self-determination continuum have been reliably identified in a variety of settings such as education (Vallerand, Blais, Brière, & Pelletier, 1989; Vallerand et al., 1992), work (Blais, Brière, Lachance, Riddle, & Vallerand, 1993), leisure (Pelletier, Vallerand, Green-Demers, Blais, & Brière, 1995; Pelletier, Vallerand, Green-Demers, Blais, & Brière, 1996), sports (Brière, Vallerand, Blais, & Pelletier, 1995; Pelletier, Fortier, et al., 1995), interpersonal relationships (Blais, Vallerand, Pelletier, & Brière, 1994), pro-environmental action (Pelletier, Green-Demers, & Béland, in press; Pelletier, Tuson, Green-Demers, Noels, & Beaton, in press), sexuality (Séguin, Green-Demers, Chantal, Ladouceur, & Pelletier, 1997; Séguin, Green-Demers, & Pelletier, 1994), and therapy (Pelletier, Tuson, & Haddad, 1997).

Moreover, the existence of the self-determination continuum has been supported by the results of several studies in which the correlations between the motivational constructs forming the continuum revealed a simplex pattern. A simplex pattern is obtained when the correlations between the constructs forming a continuum assume a particular structure (Guttman, 1969). Specifically, in a simplex pattern, the correlations between the adjacent constructs of the continuum display the greatest magnitudes, and the size of the correlations decreases progressively as a function of the distance between the constructs of the continuum. As the distance between the constructs further augments, the correlations grow increasingly negative. Finally, the highest negative correlations occur between the constructs situated at the opposite poles of the continuum. A simplex pattern validates the existence of a continuum because it reflects the theoretical influence of the fundamental dimension that defines the continuum. Like the motivational types themselves, the presence of a simplex pattern within the correlations between the motives of the self-determination continuum has been identified in several different life domains. These include education (Vallerand et al., 1993; Vallerand & Bissonnette, 1992), work (Blais et al., 1993), leisure (Pelletier, Vallerand, et al., 1995; Pelletier et al., 1996), sports (Brière et al., 1995; Pelletier, Fortier, et al., 1995), interpersonal relationships (Blais et

al., 1994), couple relationships (Blais, Sabourin, Boucher, & Vallerand, 1990), religious beliefs (O'Conner & Vallerand, 1990), pro-environmental action (Pelletier, Green-Demers, et al., in press; Pelletier, Tuson, et al., in press), and sexuality (Séguin et al., 1994, 1997).

Furthermore, the influence of the self-determination continuum has also been observed in a number of studies targeting the psychological and behavioral consequences associated with the different motives proposed by self-determination theory (1985, 1991). Because the motives proposed by Deci and Ryan are situated on a self-determination continuum, and considering that higher self-determination levels are theoretically associated with beneficial consequences, the association between motivational types and positive consequences should vary with the level of self-determination. That is, self-determined motives should relate to the most positive consequences. The relationship between motives and positive consequences should decrease with the level of self-determination of the motives considered, and eventually, grow negative for the least determined forms of motivation. This pattern has been observed repeatedly in research results.

In the educational domain, self-determination has been positively associated with perceived competence, positive emotions during class time, concentration in class, amount of time spent on homework, satisfaction with studies, and intention to pursue one's studies (Vallerand et al., 1989, 1993). Self-determination also predicted actual drop out (Vallerand & Bissonnette, 1992) and academic performance (Fortier, Vallerand, & Guay, 1995). Blais and his colleagues (1993) surveyed professionals working in the public, para-public and private sectors. Results revealed that self-determination was positively associated with quality of life and satisfaction with work, and negatively associated with burn out symptoms such as emotional exhaustion, depersonalization, lack of self-efficacy, work helplessness, physical problems, and psychological distress. At the relational level, self-determination appears to play a role in the quality of couple relationships. That is, adaptive couple behavior, dyadic

adjustment, and marital happiness, have been associated positively with the level of self-determination of couple motivation (Blais et al., 1990). Studies pertaining to sexuality revealed that sexual self-determination was associated positively with sexual self-esteem, sexual arousal, sexual satisfaction, and frequency of sexual activities (Séguin et al., 1994, 1997). Conversely, sexual self-determination has been associated negatively with sexual depression, sexual anxiety, and several sexual dysfunctions (e.g., inhibition of desire, vaginismus, and dyspareunia; Chartrand, Green-Demers, Séguin, & Pelletier, 1996). Leisure activities were long thought to be universally beneficial. A study by Pelletier, Vallerand, and their colleagues (1995) demonstrated that the relationships between leisure motivation and psychological well-being (i.e., life satisfaction, self-esteem, locus of control, and depression) varied as a function of the level of self-determination of the motivation. In the sports domain, self-determination has been positively associated with perceived competence, effort, positive emotions, sport satisfaction, and intention to continue training (Brière et al., 1995; Pelletier, Fortier, et al., 1995). The level of self-determination also predicted actual drop out (Green-Demers, Pelletier, & Legault, 1992). Religious self-determination has been associated with better life satisfaction, higher self-esteem, lower depression, and greater belief in the meaning of life (O'Connor & Vallerand, 1990). Finally, self-determination has been shown to predict ecological behaviors (Green-Demers, Pelletier, & Ménard, in press), intention to persist in therapy (Pelletier et al., 1997), and responsible voting behavior (Koestner, Losier, Vallerand, & Carducci, 1996).

In sum, the level of self-determination has been shown to covary positively with a multitude of positive psychological and behavioral consequences in several dissimilar settings. Also, as noted by Vallerand (1997), these results have been obtained in various populations and different age groups such as children (e.g., Koestner, Ryan, Bernieri, & Holt, 1984; Patrick, Skinner, & Connell, 1993; Ryan & Connell, 1989), teenagers (e.g., Legault &

Pelletier, 1994; Fortier et al., 1995; Vallerand et al., 1989), young adults (e.g., Green-Demers et al., in press; Pelletier, Fortier et al., 1995; Pelletier, Vallerand, et al., 1995), mature adults (e.g., Blais et al., 1990; Blais et al., 1993; Séguin et al., 1994), and elders (e.g., O'Connor & Vallerand, 1990; Vallerand & O'Connor, 1989, 1991).

Self-Determination Theory and Interest

Deci (1992) posits that interest, albeit typical of intrinsic behaviors (see Reeve, 1989, and Deci, 1992, for literature reviews), also relates to self-determined extrinsic motivation. Specifically, Deci (1992) proposes that interest covaries positively with the level of self-determination of extrinsic behaviors. Behaviors that are not performed out of pleasure (e.g., boring tasks) have to be regulated through extrinsic motives. Yet, if these behaviors are undertaken in a self-determined manner, they may become interesting, if not wholly pleasurable. Self-determination is thought to reduce boredom and increase interest since the discrepancy between the aversiveness of the activity is minimized by the inclusion of the behavior within the person's self-definition.

Motivation and Development: The Internalization of Self-Determination

Deci and Ryan's theory (1985, 1991) stems from the humanistic conceptual trend. In accordance with this theoretical affiliation, self-determination theory postulates the existence of innate psychological needs, such as the need for competent self-determination, which foster personal growth and development. According to Deci and Ryan (1985, 1991), motivation is not a static phenomenon. The need for self-determination is a dynamic force. People are said to display a natural inclination to internalize external contingencies, and to transform external into internal regulation. People's motives for performing a behavior would therefore tend to evolve by becoming increasingly self-determined over time. The motivational types and

subtypes situated on the self-determination continuum represent the developmental stages of this evolution. When an instrumental behavior is first performed, it is most likely to be externally regulated. If the behavior is repeated on a regular basis, the person internalizes the external contingencies, and the behavior becomes regulated by introjection. Over time, the person comes to value the outcome of the behavior and the regulation evolves into identification. Eventually, the outcome of the behavior can grow to be in agreement with the person's global value system. When this happens, the behavior is regulated by integration. Integrated regulation is the ideal outcome of the internalization process. However, there is no guarantee that motivational development will yield such a desirable result. Many factors are said to influence the development of self-determination.

Interpersonal and environmental factors which foster or inhibit the internalization of behavioral self-determination have been extensively studied (see Deci & Ryan, 1985, 1987, 1991, for literature reviews). For instance, it has been demonstrated that rewards, threats and deadlines, evaluation, surveillance, and negative feedback thwart self-determination, while perceived choice and positive feedback encourage its development (Deci & Ryan, 1987). Overall, the development of self-determination requires the social environment to be autonomy supportive, to provide structure, necessary information, constructive feedback, and to offer the opportunity for meaningful and satisfying relationships (Deci, 1992; Deci & Ryan, 1991). Thus, the emphasis in this research area has been on the characteristics of the social environment. Paradoxically, little attention has been paid to the intrapersonal processes responsible for the development of autonomous motivation. That is, the means by which people can affect their own motivation in a positive way remain to be investigated. It is argued in the context of the present thesis that the study of interest-enhancing strategy use (Sansone et al., 1992) can contribute to our comprehension of the role played by intrapersonal influence in the internalization of self-determination.

Uniting the Theoretical Contributions of Deci and Ryan (1985, 1991), and Sansone and her Colleagues (1992)

In the context of the present study, it is argued that Deci and Ryan's self-determination theory (1985, 1991) complements the model of interest and motivation self-regulation proposed by Sansone and her colleagues (1992). In a section above, unresolved fundamental issues within the model proposed by Sansone and her colleagues (1992) were raised. Specifically, it was noted that higher level purposes underlying interest-enhancing strategy use remain to be identified. Sansone and her colleagues (1992) reported that interest-enhancing strategy use led to increases in interest and motivation which outlasted the performance of the boring activity. Yet, if boredom management was the sole purpose of interest-enhancement, there would be no need for the increases in interest levels to outlive activity performance. Deci and Ryan's self-determination theory (1985, 1991) offers a plausible explanation for this phenomenon.

Self-determination theory (Deci & Ryan, 1985, 1991) postulates that, as a result of innate needs for self-determination and competence, people are inclined to attempt to increase their autonomous motivation. Boring activities are initially regulated through non-self-determined extrinsic motives (e.g., external regulation). Provided that people are driven to increase their self-determination, task performance should instigate interest and motivation self-regulation, and this effect should outlast the activity's completion. Thus, the need for self-determination could be at the source of interest-enhancing strategy use. In the present thesis, interest-enhancement is theorized to take part in a global process hypothesized to play a key role in people's development: self-determination internalization.

Self-determination internalization is a key issue in self-determination theory. As mentioned previously, *interpersonal* and environmental factors which affect this process have been extensively studied (see Deci & Ryan, 1985, 1987, for literature reviews). However, paradoxically, the *intrapersonal* processes underlying self-determination internalization have yet

to be investigated. Specifically, very little attention has been paid to the means by which people can influence their own self-determination levels. It is proposed here that interest-enhancing strategy use constitutes an intrapersonal mechanism capable of contributing to the internalization of self-determination. That is, it is hypothesized that interest-enhancing strategy use generates higher interest, and that higher interest yields greater self-determination.

To summarize, it is argued here that the integration of the theoretical perspectives proposed by Deci and Ryan (1985, 1991), and Sansone and her colleagues (1992) has the potential to lead to a better understanding of interest and motivation self-regulation. Sansone and her colleagues (1992) proposed an innovative model of interest and motivation self-regulation. Although the interest-enhancement part of this model appears quite promising, it lacks comprehensive motivational theoretical foundations. Deci & Ryan's self-determination theory (1985, 1991) provides such a theoretical basis. However, the intrapersonal processes underlying self-determination internalization, a key component of this theory, have been largely neglected. The study of interest-enhancing strategies might yield useful insight with respect to this issue. It is proposed in the context of the present thesis that the perspectives of Deci and Ryan (1985, 1991), and Sansone and her colleagues (1992), are complementary and would benefit from being joined to create a more comprehensive interest and motivation self-regulation model. The following section outlines the hypotheses that are tested in the present thesis.

THE PRESENT PROJECT

Goals and Hypotheses

Based on the works of Sansone and her colleagues (1992) concerning interest and motivation self-regulation, and Deci and Ryan (1985, 1991) regarding self-determined motivation, the goal of the present thesis was to investigate the interrelations between interest-enhancing strategy use, interest, and self-determination. That is, the overall objective was to create and test an interest and motivation self-regulation model comprising three main components: Interest-enhancing strategies, interest, and self-determination. The hypotheses that were specific to each study composing the thesis are detailed at the beginning of their respective chapters. The general hypotheses that were tested within the full research project are outlined below.

Hypothesis 1. In line with the interest and motivation self-regulation model proposed by Sansone and her colleagues (1992), it was hypothesized that, when people are faced with an uninteresting task, they will use the five following interest-enhancing strategies: Challenge enhancement, exploitation of stimulation from the physical context, introduction of variety within the task, provision of self-relevant rationales, and focused attentional involvement in task accomplishment.

Hypothesis 2. Interest-enhancing strategy use was hypothesized to be associated positively with higher levels of interest. That is, a more frequent use of each of the five proposed interest-enhancing strategies was expected to interrelate with higher interest levels.

Hypothesis 3. Interest was hypothesized to be associated positively with self-determination, as defined by self-determination theory (Deci & Ryan, 1985, 1991). Specifically, higher interest levels were expected to relate to greater levels of self-determination.

Hypothesis 4. Interest-enhancing strategy use was hypothesized to be associated positively with long term changes in interest, and changes in interest were hypothesized to be associated with changes in self-determination. Thus, frequent interest enhancing strategy use was expected to relate to long term gains in interest, and long term gains in interest were expected to relate to long term gains in self-determination.

Overview of Studies

Study 1 was a cross-sectional questionnaire survey. The goal of this study was to generate a model of interest and motivation self-regulation derived from the theories contributed by Sansone (1992), Deci (1985, 1991), and their colleagues. Data analyses were performed using structural equation modeling. In this study, a model generating rather than strictly confirmatory approach was adopted (Jöreskog, 1993).

Like Study 1, Study 2 was a cross-sectional questionnaire survey. The goal of Study 2 was to replicate the results obtained in Study 1, that is, to cross-validate the interest and motivation self-regulation model generated in Study 1. Here again, analyses were performed using structural equation modeling. However, in Study 2, a strictly confirmatory approach was favored (Jöreskog, 1993).

In Study 3, the interest and motivation self-regulation model was tested using a longitudinal design. The goal of this study was to provide temporal support for the hypothesized causal impact of interest-enhancing strategy use on subsequent levels of interest and self-determination levels. In this study, participants completed a questionnaire assessing interest-enhancing strategy use, interest, and self-determination twice, at a ten week interval. Analyses were performed using a special structural equation modeling procedure designed to identify predictors of intraindividual change: The base-free measurement of change (Raykov, 1992a). A "control" group also completed the research survey at Time 2. The frequency of

interest-enhancing strategy use of both groups were compared to assess whether completing the Interest-Enhancing Strategies Scale at Time 1 had encouraged the participants in the "experimental" group to use these strategies more frequently thereafter, thus affecting their responses at Time 2.

Study 4 was the final study of the project. In this study, the interrelations between interest-enhancing strategies, interest, and motivation, were tested in the context of an experimental design. In this laboratory experiment, interest-enhancing strategy use was manipulated while participants performed a monotonous free recall computer task. The study comprised six experimental conditions corresponding to five interest-enhancing strategy groups (i.e., challenge enhancement, attentional involvement, self-relevant rationales, introduction of variety, and exploitation of stimulation), and one control group. Interest and motivation levels were measured on several occasions throughout the experiment to monitor their evolution.

CHAPTER TWO

STUDY 1

Creation of a Model of Interest and Motivation Self-Regulation

This cross-sectional study was conducted in the context of undergraduate university courses. Three main categories of variables were surveyed: Interest-enhancing strategies, interest towards uninteresting academic tasks, and academic motivation. The objective of the study was to generate a model of interest and motivation self-regulation derived from the combination of the theoretical propositions offered by Sansone (1992), Deci (1985, 1991), and their colleagues. The conceptual hypothesized model is depicted in Figure 2. It was first hypothesized that students use the five proposed interest-enhancing strategies when coping with less-interesting academic activities. That is, when performing an uninteresting academic task, students create challenges for themselves, provide themselves with self-relevant rationales for performing the task, immerse their attention in the task, use stimulation from their physical surroundings, and introduce variety within the task. Second, it was hypothesized that frequent use of the five proposed interest-enhancing strategies is associated with higher interest towards boring academic tasks. Third, higher interest towards boring academic tasks was, in turn, hypothesized to be associated with greater self-determination. Because this was a first attempt at building an interest and motivation self-regulation model composed of the particular set of variables under study, a model generating rather than strictly confirmatory approach was adopted (Jöreskog, 1993).

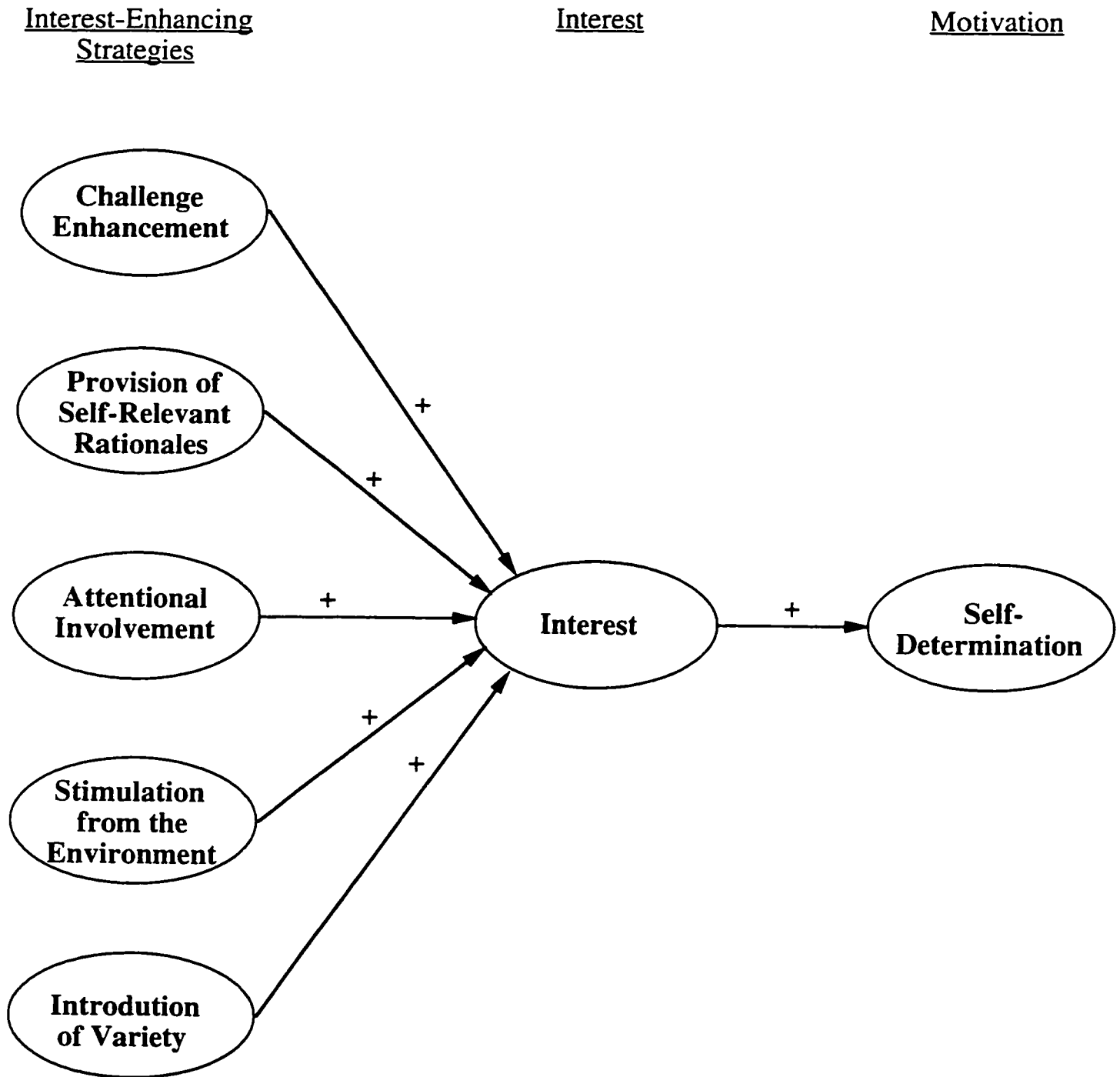


Figure 2. Hypothesized Interest and Motivation Self-Regulation Model

Method

Participants and Procedure

A total of 360 university students were recruited in a variety of undergraduate courses offered by the Faculty of Social Sciences. However, a substantial proportion (29%) of the participants failed to provide all of the information necessary for data analyses. Forty-two participants were excluded from the sample because their responses presented series of adjacent missing values. Yet, it did not appear necessary to exclude the remaining 62 cases with missing data because these cases presented only a few random missing data points. No patterns could be detected in the distribution of the missing values within the cases, nor between the variables. Thus, for the 62 participants with random missing data, the sample mean was substituted for missing values for each item of the research questionnaire.

The sample ($N=318$) comprised 100 males and 210 females (8 cases did not report their gender), ranging in age from 18 to 50 years ($M=21$ years; $SD=5.02$). The vast majority of participants were enrolled with full-time status. A small minority (3%) reported studying on a part-time basis. The self-reported grade point average of the participants ranged from 1.0 to 10.0, on a 10 point scale ($M=6.7$; $SD=1.5$). Thus, academic success varied broadly in the sample under study. Moreover, grade point average scores formed an approximately normal distribution (kurtosis=.32; skewness=-.39).

With the permission of the professor, the participants filled out the questionnaires during class time. It took approximately 20 minutes to complete the research survey. The questionnaire package contained: (a) an introduction letter explaining the goal of the study and outlining the participants rights according to standard ethical procedures, (b) a measure of participants' motivation towards the course in which they were surveyed, (c) a measure of participants' level of interest towards different academic tasks pertaining to the course in which

they were surveyed, (d) a measure of how frequently various interest-enhancing strategies were used while performing the most boring academic tasks identified for the course, and (e) demographic questions. The introduction letter and the questionnaire package are presented in Appendix A.

Measures

Interest-enhancing strategy use. The self-reported frequency of interest-enhancing strategy use was assessed using the Interest-Enhancing Strategies Scale (IESS; Green-Demers, Pelletier, Gushue, & Stewart, 1994). The 15 items of the IESS are divided into five subscales designed to measure how frequently people utilize each of the five proposed interest-enhancing strategies: (1) challenge enhancement, (2) exploitation of stimulation from the physical context, (3) introducing variety within the task, (4) provision of self-relevant rationales, and (5) focused attentional involvement on the task. The items are presented following a general statement: "Please indicate how frequently you use the following strategies when you perform less-interesting academic tasks pertaining to this course". Items are presented in random order. Participants rate the items on a 9-point scale ranging from 1 ("Never") to 9 ("Always"). Examples of items for each subscale of the IESS can be found in Table 1.

Green-Demers and her colleagues (1994) assessed the factorial structure of the IESS by means of exploratory and confirmatory factor analyses on independent samples. Both analyses yielded satisfactory results. The items of the IESS loaded significantly on their target factors and no cross-loadings were identified. Moreover, the factorial model postulated a priori was indeed supported by the fit indices yielded by the first CFA attempt. A posteriori estimation of additional parameters was unnecessary. Thus, the results of this analysis were obtained in a strictly confirmatory situation (Jöreskog, 1993). Also, the construct validity of the IESS was

Table 1

Examples of Items for Each Subscale of the Interest-Enhancing Strategies Scale (Study 1)

Subscale	Example
Challenge Enhancement	I set time limits in order to challenge myself.
Provision of Self-Relevant Rationales	I think of personal reasons for performing the activity.
Attentional Involvement	I concentrate on what I'm doing at the moment.
Stimulation from the Environment	I like to drink pop, milk, juice, etc. while I perform the task.
Introduction of Variety	I approach the different parts of the task by using a variety of methods.

supported by correlations between its subscales and relevant psychological and academic constructs, such as distraction, positive emotions, perceived competence, interest towards interesting and boring academic tasks, and academic performance. Finally, the internal consistency values (Cronbach's alpha) of the IESS ranged from .63 to .85 (Average Cronbach's alpha = .75).

Interest towards boring academic tasks. Preliminary studies revealed that, out of a list of 10 academic tasks (e.g., listening to lectures, reading assignments, taking notes, etc.), three tasks displayed relatively low interest levels (Green-Demers, 1993, 1994). These three tasks were: Writing exams, doing routine studying, and studying for exams. In the present study, interest towards boring academic tasks was evaluated by asking the participants to rate the three aforementioned tasks on a scale ranging from 1 ("Not interesting at all") to 9 ("Totally interesting"). In an attempt to increase the congruence between the specificity of the behaviors assessed by the IESS and the interest items, participants were told to evaluate their levels of interest towards the three boring tasks in the context of the particular course in which they were being surveyed. In the present study, the three interest scores had an internal consistency value (Cronbach's alpha) of .82.

Academic motivation. Self-determination was measured using an adapted version of the Academic Motivation Scale (Vallerand et al., 1992, 1993). This instrument is composed of 28 items corresponding to participants' motives for attending university. Specifically, the AMS comprises seven subscales (4 items/subscale) designed to assess the motivational constructs proposed by Deci and Ryan's self-determination theory (1985, 1991): intrinsic motivation for sensations, knowledge, and accomplishment, extrinsic motivation by external (EXT), introjected (INTRO), and identified regulation (IDEN), and amotivation (AMO). The items are presented as potential answers to a general question: "Why do you attend university?" In the context of the present study, the AMS was altered to assess participant's

motives for attending the course in which they were surveyed. This was accomplished by changing the initial question to: "Why do you attend this course?", and by rewording the items, when necessary, to fit the context of the present study. Also, albeit the original anchor points of the rating scale were left unchanged, the original 5 point scale was replaced with a 9 point scale, where 1 is labelled "Does not correspond at all" and 9 is labelled "Corresponds Exactly". This was done to increase the precision of the scale, so that minor changes might be more easily detected. A final modification concerns the integrated regulation motivation construct. Integration items failed to form a distinct factor in the original scale validation study performed by Vallerand and his colleagues (Vallerand et al., 1989). Vallerand and his colleagues explained this occurrence by arguing that the college students composing the original sample were possibly too young to have reached the stage of integrated regulation towards academic activities (Vallerand et al., 1992). Consequently, the integration subscale was excluded from further studies assessing the AMS psychometric properties (Vallerand et al., 1992, 1993). A different point of view is favored in the present thesis. Education is part of peoples' lives for many years in our society. Why would it be unlikely for the motives underlying the activities of this life domain to become regulated by integration? It does not appear to be such an implausible occurrence. Thus, in the present thesis, an attempt was made to measure this dimension of extrinsic motivation: An integrated regulation subscale was constructed and included in the adapted version of the Academic Motivation Scale. Examples of items for each subscale of the modified version of the AMS are reported in Table 2.

The AMS validity and reliability has been firmly established by past studies (see Vallerand et al., 1992, 1993, for a review of the literature pertaining to the AMS psychometric properties). Overall, the AMS has been shown to possess a sound factorial structure, and its subscales have demonstrated satisfactory construct validity, temporal stability, and internal consistency. However, because an adapted version was to be utilized in the present thesis, the

Table 2

Examples of Items for the Adapted Version of the Academic Motivation Scale (Study 1)

Subscale	Example (Why do you attend this course?)
Intrinsic Motivation for Knowledge	Because I experience pleasure and satisfaction while learning new things.
Intrinsic Motivation for Accomplishment	For the pleasure I experience while surpassing myself in my studies.
Intrinsic Motivation for Sensations	For the pleasure I experience when I read interesting authors.
Extrinsic Motivation by Integrated Regulation	Because knowledge in this field is very meaningful to me.
Extrinsic Motivation by Identified Regulation	Because it's one of the ways I have chosen to acquire skills in an area which is important to me.
Extrinsic Motivation by Introjected Regulation	To show to myself that I am an intelligent person.
Extrinsic Motivation by External Regulation	Because I need the credits for my degree.
Amotivation	Honestly I don't know, I can't understand what I'm doing in this course.

psychometric properties of the adapted version were assessed on an independent sample prior to the present study (Green-Demers, 1994). The adapted version displayed satisfactory psychometric properties. These results were quite similar to the results obtained in the original validation studies (Vallerand, 1992, 1993). Specifically, a confirmatory analysis revealed a sound factorial structure, and the subscale scores displayed adequate internal consistency. Moreover, like the original version of the AMS, the modified version revealed correlations between the subscales that generally presented a simplex pattern, which offered support to the self-determination continuum.

For the purposes of the present study, global self-determination indices (SDI) were generated by weighting each item, according to the position of the subscale it represents on the self-determination continuum, and then summing the weighted scores² (e.g., $SDI1=(2INTEG1)+(IDEN1)-(ER1)-(2AMO1)$). In line with previous studies using global self-determination scores, the more self-determined forms of motivation (i.e., integration and identification) were assigned the weights of +2 and +1, while the less self-determined forms of motivation (i.e., external regulation and amotivation) were assigned the weights of -1 and -2 (Blais et al., 1990; Fortier et al., 1995; Grolnick et Ryan, 1987, 1989; Grolnick, Ryan, & Deci, 1991; Patrick, Skinner, & Connell, 1993; Ryan & Connell, 1989; Vallerand & Bissonnette, 1992). Past research provided extensive support for the validity and reliability of self-determination indices (e.g., Blais et al., 1990). Moreover, the use of self-determination indices is recommended, for the sake of parsimony, in most structural equation modeling procedures (Vallerand, 1997). In the present study, the self-determination indices displayed a satisfactory level of internal consistency (Cronbach's $\alpha=.90$). As previously mentioned, intrinsic motivation subscales were not utilized in the context of the present thesis because

² Because an even number of items is required to compute a self-determination index, the introjection items were excluded.

intrinsic motivation refers to pleasurable activities for which interest levels are likely to be spontaneously high. Accordingly, interest towards intrinsically motivated activities should not require interest-enhancing strategy use.

Analyses

Data analysis was completed in three steps: (a) preliminary analyses, (b) descriptive analyses, and (c) structural equation modeling procedures. Preliminary analyses addressed issues related to structural equation modeling assumptions. Descriptive analyses provided summary statistics on each of the variables under study. Structural equation modeling (SEM) procedures were the focal point of the analyses of the present study. This final step was itself comprised of three stages: Estimation of the measurement model, estimation of the hypothesized model, and estimation of an alternative model. Structural equation modeling procedures were performed by the means of the program LISREL VIII (Jöreskog & Sorbom, 1996a, 1996b). Options preferred in the selection of the estimation procedure, the analyzed matrix type, and the assessment of overall model fit are specified in the paragraphs below.

Estimation procedure. Estimation was performed using maximum likelihood (ML) fitting function. This fitting method was selected because of its statistical properties. Specifically, ML parameters are unbiased, consistent, asymptotically efficient, and the ML fit function is scale invariant and scale free (Bollen, 1989). Also, the distribution of estimated parameters is normal, which allows to test for their statistical significance. Finally, the overall fit between the sample covariance and the covariance reproduced by the estimation of overidentified models can be statistically evaluated.

Matrix type. LISREL VIII provides a variety of options concerning the type of matrix that can be obtained from the raw data for the program to analyze. Likert scale data and continuous data are most often analyzed using correlation or covariance matrices. However,

according to Cudeck (1989), using a correlation matrix as a basis for SEM procedures can lead to a number of potential errors. That is, correlation matrix use can modify the model under study, yield inaccurate fit indices, and incorrect standard errors (Cudeck, 1989). Thus, in the present study, a covariance matrix was analyzed in order to avoid these potential hazards.

Overall assessment of model fit. Evaluation of model fit involves many criteria referring to statistical, theoretical, and practical issues (Byrne, in press). In view of the current state of controversy regarding measures of overall model fit, it is generally recommended to report multiple indices (Bollen, 1989; Byrne, in press; Hoyle & Panter, 1995; Marsh, Balla, & McDonald, 1988). Thus, in the present thesis, a variety of statistical and non-statistical criteria were examined to determine the consonance between the observed and fitted covariance matrices: (a) the chi-square likelihood ratio, (b) the root mean square error of approximation, (c) the goodness-of-fit index, (d) the comparative fit index, (e) the parsimony comparative fit index, and (f) the expected cross-validation index.

The *chi-square likelihood ratio* (χ^2) evaluates whether the estimated covariance matrix differs significantly from the sample covariance matrix (Jöreskog & Sorbom, 1989). Theoretically, if the hypothesized model permits a perfect estimation of the observed sample covariance, no such difference should be detected. The null hypothesis is that the residuals obtained by subtracting the reproduced covariance matrix from the sample covariance matrix are equal to 0. However, because the chi-square tends to be oversensitive to sample size, the null hypothesis is generally rejected (Bentler & Bonnett, 1981; Hu & Bentler, 1995; La Du & Tanaka, 1989; Marsh et al., 1988; Mulaik et al., 1989). Thus, it is not valid, in most applications, to use the chi-square to test the null hypothesis of overall model fit (Jöreskog & Sorbom, 1989). Yet, because the overall match between the model and the observed data has conventionally been assessed using the chi-square likelihood ratio (Hu & Bentler, 1995), this index is reported for the sake of tradition. Also, in spite of its limitations as a measure of

overall fit, the chi-square can be quite useful in providing a basis to compare nested models (Hoyle & Panter, 1995).

The *root mean square error of approximation* (RMSEA; Steiger, 1990) assesses the estimated discrepancy, per degree of freedom, between the population covariance matrix and the model. Thus, the RMSEA is designed to react to the parsimony of the estimated model. The RMSEA value would be 0 if the fit was perfect. According to Browne and Cudeck (1993) values smaller than .05 indicate a good fit, and values smaller than .08 a reasonable fit.

The *goodness-of-fit index* (GFI; Jöreskog & Sorbom, 1989) is the ratio of the minimum fit function before and after model estimation (Tanaka & Huba, 1984). It is an absolute fit index that represents the proportion of variance in the sample covariance matrix which is accounted for by the estimated model (Bollen, 1989). Its theoretical range varies from 0 to 1, and values above .90 are considered satisfactory. However, because the GFI is affected by sample size (Anderson & Gerbin, 1984; Jöreskog & Sorbom, 1996a; Marsh et al., 1988), GFI values below .90 can be expected when the sample size is not very large, especially if the model is complex (Bollen, 1989), and if the latent constructs are not independent from one another (Hu & Bentler, 1995).

The *comparative fit index* (CFI; Bentler, 1990) belongs to a class of non-statistical indices called incremental fit indices (Bollen, 1989) where the chi-square value of the estimated model is compared to the chi-square value of a "null" model. The null model is a restrictive model which postulates the total independence of all observed variables. Thus, in the null model, the covariance between the variables is completely disregarded. The ratio of the fit of the estimated model to the null model represents the gain in adjustment resulting from the inclusion of the covariance between the elements of the estimated model. According to Marsh

and his colleagues (Marsh et al., 1988), the CFI is relatively independent of sample size. CFI values range from 0 to 1 and values above .90 are considered acceptable.

The *parsimony comparative fit index* (PCFI; Mulaik et al., 1989) is derived from the CFI. This index is adjusted to reflect the parsimony of the model by compounding the value of the CFI with the ratio of the degrees of freedom of the estimated model to the null model. Thus, the PCFI carries a penalty and its severity varies according to the number of estimated parameters in the model. PCFI values range between 0 and 1, and values above .50 are considered acceptable (Mulaik et al., 1989).

The *expected cross-validation index* (ECVI; Browne & Cudeck, 1993) evaluates the likelihood of cross-validation across samples of similar size drawn from the same population. The ECVI has no set range, it is utilized to rank order different models according to their potential for cross-validation.

Results

Preliminary Analyses

Maximum Likelihood estimation and structural equation modeling procedures are valid provided that the data conform to a certain number of basic assumptions. The main goal of the preliminary analyses was to assess whether these assumptions held for the sample under study.

Absence of outliers. The distribution of the standardized scores for all the variables included in the model was examined to detect potential univariate outliers. No cases with standardized scores greater than |3| were identified. Multivariate standardized residuals, leverage, and Mahalanobis' and Cook's distances were computed to screen for multivariate outliers. Multivariate standardized residuals displayed acceptable values, ranging from -2.03 to 1.73. Leverage scores are considered "safe" when inferior to .20 (Huber, 1981). There were

no leverage scores above this limit within the cases under study. Cook's distances below 1.00 are satisfactory (Hamilton, 1992). No values above this cut-off were identified within the present sample. Finally, six cases (2%) presented significant Mahalanobis' distances ($\chi^2_{(df=22)} > 48.27, p < .001$). These cases were removed from further analyses, yielding a final sample size of 312 participants.

Sample size. Structural equation modeling is a method designed for large samples. Two hundred cases is generally considered to be the minimum number of participants required to obtain a stable solution (Ullman, 1996). The present sample size ($N = 312$) is deemed adequate for the purposes of the present study.

Normality. The summary statistics of all the variables involved in the study were first examined. The means, standard deviations, kurtosis and skewness values, of the indicators of the interest and motivation self-regulation model are shown in Table 3. Mean and standard deviation values revealed that the variables displayed acceptable dispersion. Kurtosis values ranged from -1.46 to .32, while skewness values ranged from -.76 to .09. Despite a few high values, univariate values of kurtosis and skewness were considered adequate since mean kurtosis ($|M| = .78$) and mean skewness ($|M| = .26$) were within an acceptable range of 0 to 1.00 (Muthén & Kaplan, 1985). Overall, examination of summary statistics provided no reason to suspect that the distribution of the variables departed significantly from normality. Moreover, from a multivariate perspective, the distribution of standardized residuals appeared normal.

Linearity. A random selection of bivariate scatterplots were inspected to detect potential departures from linearity. The bivariate distributions generally displayed linear configurations. Also, as mentioned previously, the distribution of the standardized multivariate residuals appeared quite normal.

Summary Statistics for the Indicators of the Interest and Motivation Self-Regulation Model (Study 1)

Variables	Mean	Standard Deviation	Kurtosis	Skewness
Challenge Enhancement (CH)	16.01	5.87	-.41	-.46
CH1	4.51	2.41	-1.03	-.01
CH2	6.05	2.39	-.36	-.76
CH3	5.54	2.32	-.71	-.50
Self-Relevant Rationales (RAT)	14.59	5.32	-.37	-.18
RAT1	5.11	2.28	-.90	-.22
RAT2	4.18	2.31	-1.05	.12
RAT3	5.31	2.25	-.79	-.31
Attentional Involvement (ATT)	16.59	4.99	-.20	-.30
ATT1	5.36	2.15	-.67	-.23
ATT2	6.06	1.88	-.13	-.57
ATT3	5.18	2.05	-.59	-.07
Stimulation from the Environment (STIM)	14.35	5.70	-.54	-.02
STIM1	4.56	2.31	-.88	.16
STIM2	4.56	2.90	-1.46	.08
STIM3	5.23	2.69	-1.25	-.26
Introduction of Variety (VAR)	15.15	4.47	.12	-.43
VAR1	5.69	2.10	-.09	-.64
VAR2	4.45	2.01	-.53	.12
VAR3	5.01	2.02	-.54	-.31
Interest (INT)	11.87	5.75	-.63	.22
INT1	4.03	2.33	-1.02	.22
INT2	4.05	2.02	-.59	.11
INT3	3.79	2.31	-1.98	.32
Self-Determination (SD)	2.19	36.37	-.67	-.15
SDI1	-3.69	10.95	-.84	.08
SDI2	-2.08	10.65	-.66	-.04
SDI3	2.91	10.03	-.40	-.40
SDI4	5.05	9.95	-.60	-.17

Note. The theoretical range is 1 to 9 for all individual items except self-determination indices, which range from -24 to +24. The theoretical range is 3 to 27 for all global scores, except self-determination. The theoretical range for the global self-determination score is -96 to +96.

Homoscedasticity. The bivariate scatterplots were also screened to identify uneven distributions of the variance between the pairs of variables. No evidence of heteroscedasticity was found.

Absence of multicollinearity. The correlations between all possible pairs of variables included in the analyses were scanned for multicollinearity. There were no correlations in excess of .90 (Tabachnick & Fidell, 1996).

Descriptive Statistics

Interest-enhancing strategies. The interest-enhancing strategies that were most frequently used by the students were attentional involvement ($M=16.59$, $SD=4.99$) and challenge enhancement ($M=16.01$, $SD=5.87$), followed by introduction of variety ($M=15.15$, $SD=4.47$), provision of self-relevant rationales ($M=14.59$, $SD=5.32$), and exploitation of stimulation from the physical context ($M=14.35$, $SD=5.70$). Considering that the theoretical range of global strategy use scores was 3 to 27, the students employed the five interest-enhancing strategies to a moderate extent when coping with uninteresting academic tasks.

Interest. In accordance with past results (Green-Demers 1993, 1994), mean interest levels towards routine studying ($M=4.05$, $SD=2.02$), writing exams ($M=4.03$, $SD=2.33$), and studying for exams ($M=3.79$, $SD=2.31$), were not very high on the 9 point scale. Therefore, the students did not find these tasks very interesting to perform.

Self-determination. The sum of the four self-determination indices ranged from -83.00 to +76.00, with an average of 2.19 ($SD=36.37$). The theoretical range of the global self-determination score is -96.00 to +96.00. Negative scores indicate an overall non self-determined level of extrinsic motivation, while positive scores indicate a globally self-determined level of extrinsic motivation. Thus, the mean level of self-determination in the

sample fell close to the mid-point of its possible range (0), with self-determination scores being normally distributed on either side of the mean (kurtosis=-.67; skewness=-.15).

Sex differences. As shown in Table 4, a comparison of the means as evaluated by Bonferroni t-tests indicated that males ($n=99$) and females ($n=206$) did not differ in their use of interest-enhancing strategies, nor in their mean levels of interest and self-determination.

Structural Equation Modeling

Testing the measurement model. It is customary to assess the quality of the measurement instruments using confirmatory factor analyses (CFA) before proceeding to the estimation of the full model. This approach allows for the systematic detection and correction of any measurement problem liable to interfere with the assessment of the structural model (Byrne, 1994).

A first CFA was performed for the Interest Enhancing Strategies Scale (IESS). The items comprising each subscale of the IESS served as the observed indicators of the underlying latent factors. First, it was hypothesized that the responses on the IESS were explained by five factors, corresponding to the five subscales of the IESS. That is, the items of the IESS were hypothesized to display significant and substantial loadings on their target factors, and zero loadings on all other factors. Second, the factors were hypothesized to be correlated, since it seemed plausible that participants would not limit themselves to the use of a single interest-enhancing strategy. Third, the error variance associated with each item was hypothesized to be small, yet significant, and its uniqueness component to be uncorrelated with that of any other item. Finally, for identification purposes, the loadings between the first indicator of each latent

Table 4

Comparison of the Means of Interest-Enhancing Strategies, Interest, and Self-Determination for Men and Women (Study 1)

Subscale	Mean (SD)		t-Value (df=303)	Probability
	Men (n=99)	Women (n=206)		
Challenge Enhancement	15.26 (5.78)	16.46 (5.96)	-1.67	.097
Provision of Self-Relevant Rationales	14.39 (5.54)	14.64 (5.25)	-.37	.709
Attentional Involvement	16.27 (5.00)	16.70 (5.07)	-.70	.486
Stimulation from the Environment	13.98 (5.88)	14.52 (5.64)	-.77	.439
Introduction of Variety	14.21 (5.02)	15.57 (4.16)	-2.49	.013
Interest	12.94 (5.59)	11.26 (5.74)	2.42	.016
Self-Determination	2.02 (34.58)	2.25 (37.11)	-.05	.959

Note. As the Levene's test for equality of variance revealed no significant differences for the pairs of means compared above, t-tests for groups with equal variances were performed. The Bonferroni correction was employed to control for the number of comparisons ($p=.05/7$ t-tests = .007). No significant differences were identified since there was no probability values in excess of .007.

construct and its target factor were fixed to 1.0³. The results supported the hypotheses. The model displayed a marginally acceptable fit ($\chi^2_{(80, N=312)}=202.67$, $p<.001$; RMSEA=.07; GFI=.92; CFI=.90; PCFI=.69). Moreover, the estimated parameters were generally significant and within an acceptable range. Two factor correlations were non-significant. Specifically, exploitation of stimulation was uncorrelated with challenge enhancement and introduction of variety. Consequently, an additional model was tested wherein the two non-significant correlations were fixed to 0. There was no significant difference between the fit of the initial and final models ($\Delta\chi^2_{(\Delta df=2, N=312)}=.66$, ns), and the fit of the final model remained satisfactory ($\chi^2_{(82, N=312)}=203.33$, $p<.001$; RMSEA=.07; GFI=.92; CFI=.90; PCFI=.70).

A second CFA was performed on the three items designed to assess interest towards less-interesting academic tasks. First, it was hypothesized that the responses on the interest items were explained by a single factor. Thus, the items were hypothesized to display significant and substantial loadings on this factor. Second, the error variance associated with each item was hypothesized to be small, yet significant, and its uniqueness component to be uncorrelated with that of any other item. Finally, for identification purposes, the loading between the first item and the interest factor was fixed to 1.0. The results supported the hypotheses. The model displayed a very satisfactory fit ($\chi^2_{(2, N=312)}=4.63$, $p=.10$; RMSEA=.07; GFI=.99; CFI=1.00; PCFI=.33). Moreover, the estimated parameters were significant and within an acceptable range. As indicated by the small number of degrees of freedom and by the PCFI, the model was not parsimonious. However, this was not considered a problem because the goal of the procedure was to identify areas of misfit within the measurement of interest. Even if the number of observed parameters did not exceed the

³ In this analysis, as in all subsequent CFAs performed in the context of this thesis, the first indicator of each latent construct was fixed to 1.0 to ensure statistical identification. However, it is important to note that this decision is arbitrary, and that, for each latent construct, any other indicator could have been selected to serve this purpose.

number of estimated parameters by much, the analysis would have detected misfitting parameters within the model.

A third and final CFA was performed on the four indices designed to assess self-determination. First, it was hypothesized that the responses on the self-determination indicators were explained by a single factor. Thus, the indicators were hypothesized to display significant and substantial loadings on this factor. Second, the error variance associated with each indicator was hypothesized to be small, yet significant, and its uniqueness component to be uncorrelated with that of any other indicator. Finally, for identification purposes, the loading between the first indicator and the self-determination factor was fixed to 1.0. The results supported the hypotheses. The model displayed a perfect fit ($\chi^2_{(1,N=312)}=.00$, $p=1.00$; RMSEA=.00; GFI=1.00; CFI=1.00; PCFI=.33). Moreover, the estimated parameters were significant and within an acceptable range. As indicated by the small number of degrees of freedom and by the PCFI, the model was not parsimonious. However, as explained in the paragraph above, this was not considered a problem because the goal of the procedure was to identify areas of misfit within the measurement of self-determination.

Testing the hypothesized model. As previously specified, the hypothesized model is depicted in Figure 2 (see p. 37). The measurement submodel was specified in accordance with the results reported in the previous section. The statistical hypotheses corresponding to the structural portion of the model are described below. First, the regression coefficients of interest on challenge enhancement, provision of self-relevant rationales, attentional involvement, stimulation from the environment, and introduction of variety, were hypothesized to be substantial, positive, and significant. Second, the regression coefficient of self-determination on interest was also hypothesized to be substantial, positive, and significant. Third, the residuals representing the error of prediction of both regression equations were hypothesized to be significant, and the covariance between these residuals was hypothesized to

be zero. Fourth, with the exception of the two factor correlations that were fixed to 0 in the final step of the CFA on the IESS, the exogenous factor correlations were hypothesized to be substantial, positive, and significant.

The covariance matrix obtained from the observed data is presented in Appendix B. An illustration of the resulting model is presented in Figure 3. Because of space constraints, the correlations between the exogenous factors are displayed separately, in Table 5. Model estimation yielded a satisfactory fit ($\chi^2_{(195, N=312)}=367.45$, $p<.001$; RMSEA=.05; GFI=.90; CFI=.93; PCFI=.79; ECVI=1.55). However, most hypothesized paths between the latent constructs were non-significant. A single hypothesized path conformed to the hypotheses: Interest predicted self-determination significantly ($\beta=.38$), and explained 15% ($p<.01$) of its variance. Alternatively, the five proposed interest-enhancing strategies failed to predict interest significantly. Finally, the estimated correlations between the interest-enhancing strategies were all significant, and of acceptable magnitude.

In sum, the results are in accordance with the hypothesized model, save for the five paths between interest-enhancing strategies and interest. This finding is puzzling. Albeit none of the paths between the strategies and interest displayed significant regression coefficients, the non-significant paths explained a significant proportion of the variance of interest ($R^2=18\%$, $p<.01$). It is argued here that this paradox results from the fact that the five strategies are intercorrelated. As shown in Table 5, the interest-enhancing strategies display a number of sizable correlations among themselves. These correlations could indicate the presence of a hierarchy in the sequence of strategy use. Logically, the strategy most likely to mediate the impact of all others is attentional involvement. The use of the four other strategies could facilitate attentional involvement. Attentional involvement, in turn, could create interest. This speculation is supported by statistical and theoretical considerations. Statistically, attentional involvement is the only strategy which is correlated with all four others. From a theoretical

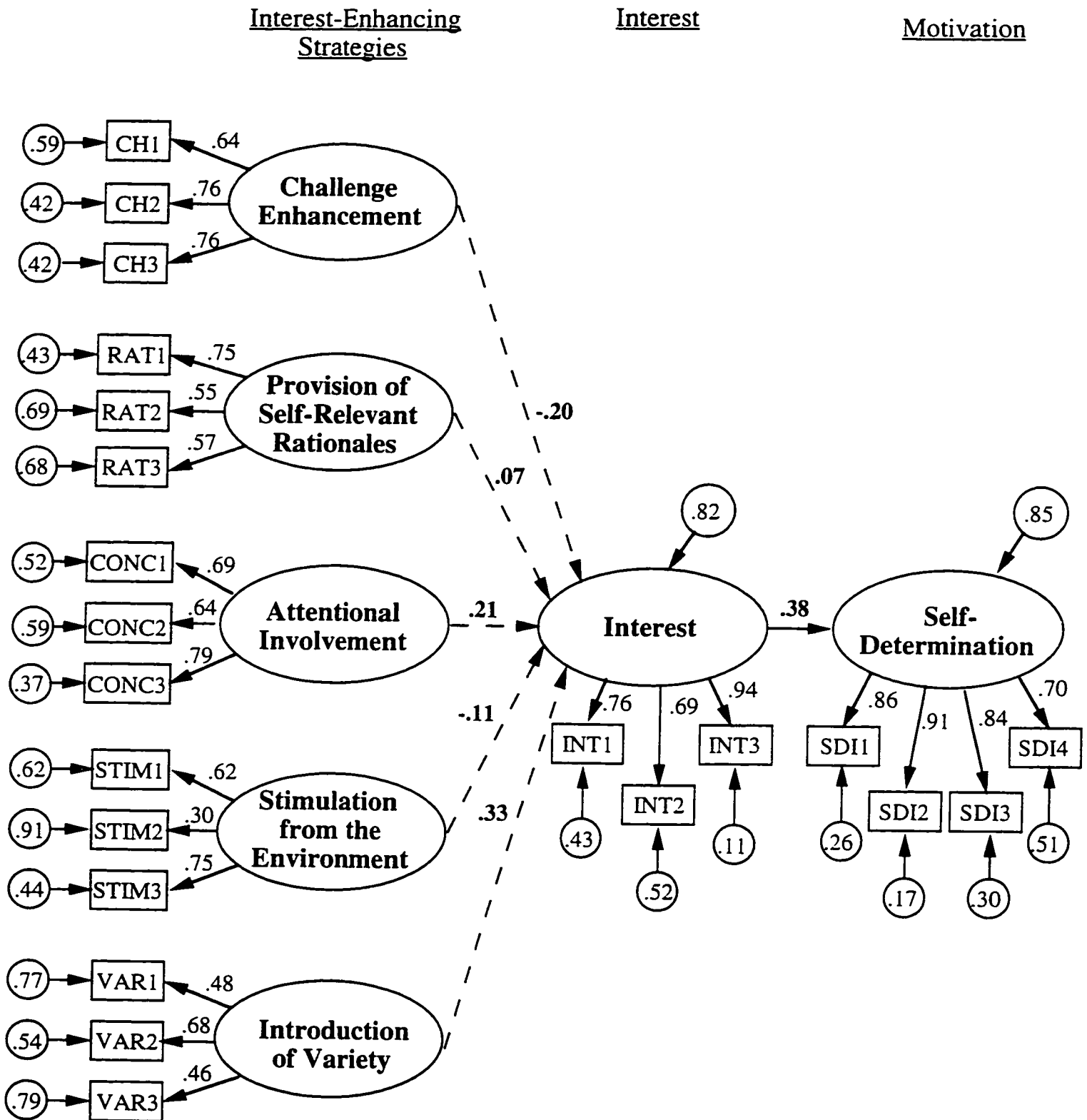


Figure 3. Interest and Motivation Self-Regulation Model ($N=318$; Study 1). All the parameters in the model are standardized. Non-significant paths are indicated by a dashed arrow. All other parameters are significant at the .01 level.

Table 5

Correlations (Phi Values) Between the Exogeneous Factors of the Interest and Motivation Self-Regulation Model (Study 1)

Factors	CH	RAT	ATT	STIM	VAR
Challenge Enhancement (CH)	1.00				
Provision of Self-Relevant Rationales (RAT)	.56**	1.00			
Attentional Involvement (ATT)	.66**	.63**	1.00		
Stimulation from the Environment (STIM)	--	.19*	-.19*	1.00	
Introduction of Variety (VAR)	.85**	.73**	.67**	--	1.00

* $p < .05$

** $p < .01$

point of view, attentional involvement is the only strategy that has been associated, in the literature, with a gratifying experiential component. As mentioned in a previous section, the merging of action and awareness is theorized to result in a most pleasant state called "flow", which has been shown to play an important role in the experience of interest (Csikszentmihalyi, 1975, 1982). On the basis of the aforementioned arguments, a new interest and motivation self-regulation model was hypothesized a posteriori and tested. This procedure is described in the following section.

Testing an alternative model. The revised hypothesized model is depicted in Figure 4. Again, the measurement submodel was specified in accordance with the results reported in the section entitled: "Testing the measurement model". The statistical hypotheses corresponding to the structural portion of the model are presented below. First, the regression coefficients of attentional involvement on challenge enhancement, provision of self-relevant rationales, stimulation from the environment, and introduction of variety were hypothesized to be substantial, positive, and significant. Second, the regression coefficients of interest on attentional involvement was hypothesized to be substantial, positive, and significant. Third, the regression coefficient of self-determination on interest was hypothesized to be substantial, positive, and significant. Fourth, the residuals representing the error of prediction of all regression equations were hypothesized to be significant, and the covariance between these residuals was hypothesized to be zero. Fifth, with the exception of the two factor correlations that were fixed to 0 in the final step of the CFA on the IESS, the exogeneous factor correlations were hypothesized to be substantial, positive, and significant.

Model estimation yielded a satisfactory fit ($\chi^2_{(199, N=312)}=372.31$, $p<.001$; RMSEA=.05; GFI=.90; CFI=.93; PCFI=.80; ECVI=1.54). One hypothesized path, the path between introduction of variety and interest, was non-significant. Therefore, a final model was estimated in which this non-significant path was fixed to 0. The difference between the fit of

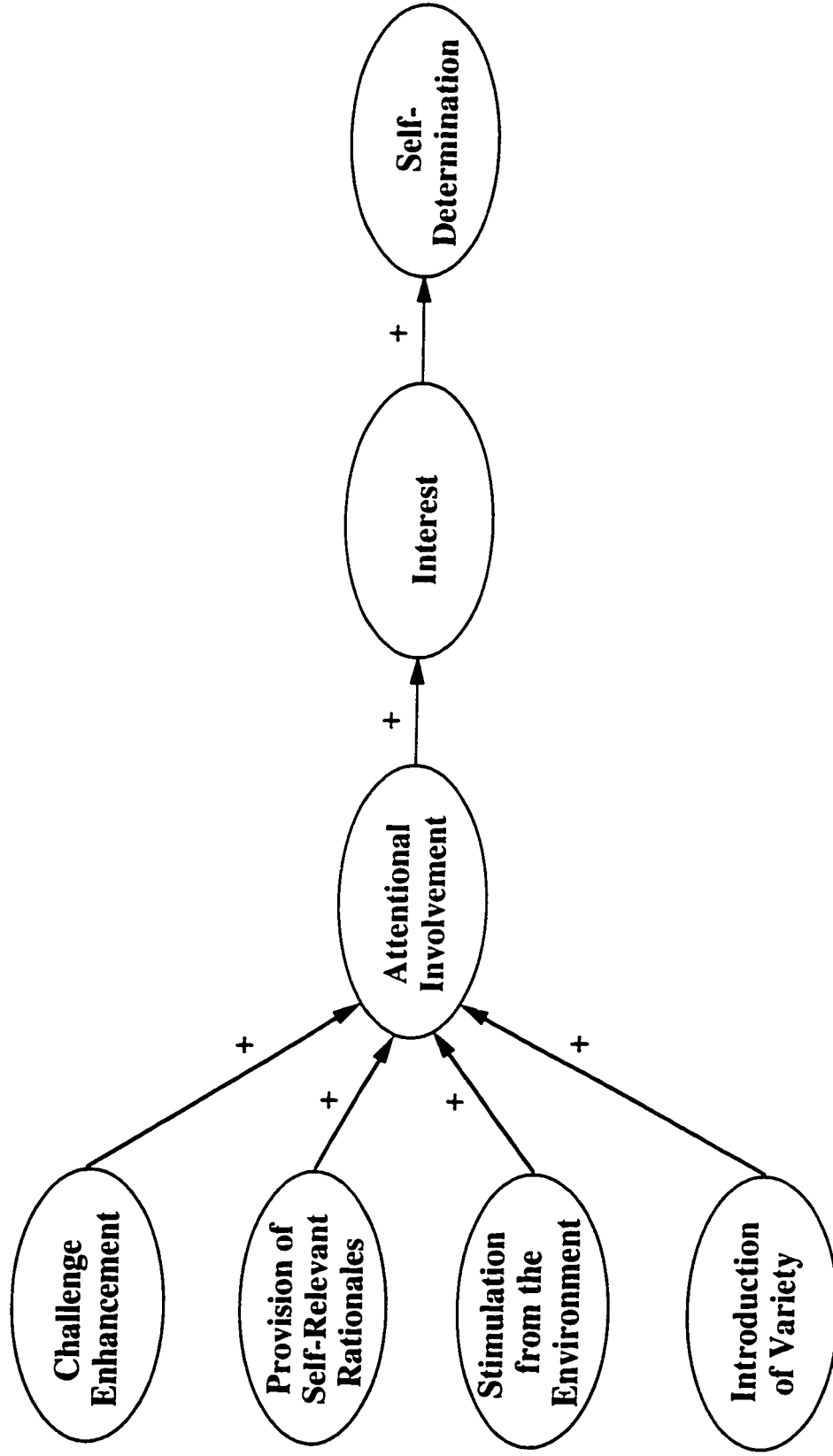


Figure 4. Revised Hypothesized Interest and Motivation Self-Regulation Model

the initial and final model was non-significant ($\Delta\chi^2_{(\Delta df=1, N=312)}=.01, ns$), and the fit of the final model remained satisfactory ($\chi^2_{(200, N=312)}=372.32, p<.001$; RMSEA=.05; GFI=.90; CFI=.93; PCFI=.81; ECVI=1.54). The RMSEA and the CFI were within an acceptable range. The GFI revealed that the model explained 90% of the sample covariance matrix. The PCFI indicated that the model presented a satisfactory degree of parsimony. There is no important difference between the ECVI of the hypothesized model (1.55) and the ECVI of the revised model (1.54). Thus, both models are equally likely to cross-validate in another sample drawn from the same population. An illustration of the resulting model is presented in Figure 5. Because of space constraints, the correlations between the exogenous factors are reported separately, in Table 6.

Moreover, most hypothesized paths were supported by the results. Specifically, challenge enhancement and provision of self-relevant rationales predicted attentional involvement significantly, the magnitude of these regression coefficients was moderate, and their valence was positive. Thus, a more frequent use of challenge enhancement and provision of self-relevant rationales was associated with a more frequent use of attentional involvement. Surprisingly, the regression of attentional involvement on stimulation from the environment yielded a small, significant, and negative coefficient. That is, a more frequent recourse to the stimulation from the physical environment was associated with less frequent attempts to involve one's attention on the task. Together, challenge enhancement, provision of self-relevant rationales, and stimulation from the environment predicted a substantial proportion of the variance of attentional involvement ($R^2=.62, p<.01$). Attentional involvement, in turn, predicted interest significantly. The magnitude of the regression coefficient was moderate and attentional involvement predicted a modest, yet significant, proportion of the variance of interest ($R^2=.15, p<.01$). Thus, more frequent use of attentional involvement was associated with higher levels of interest. Next, interest levels predicted self-determination significantly.

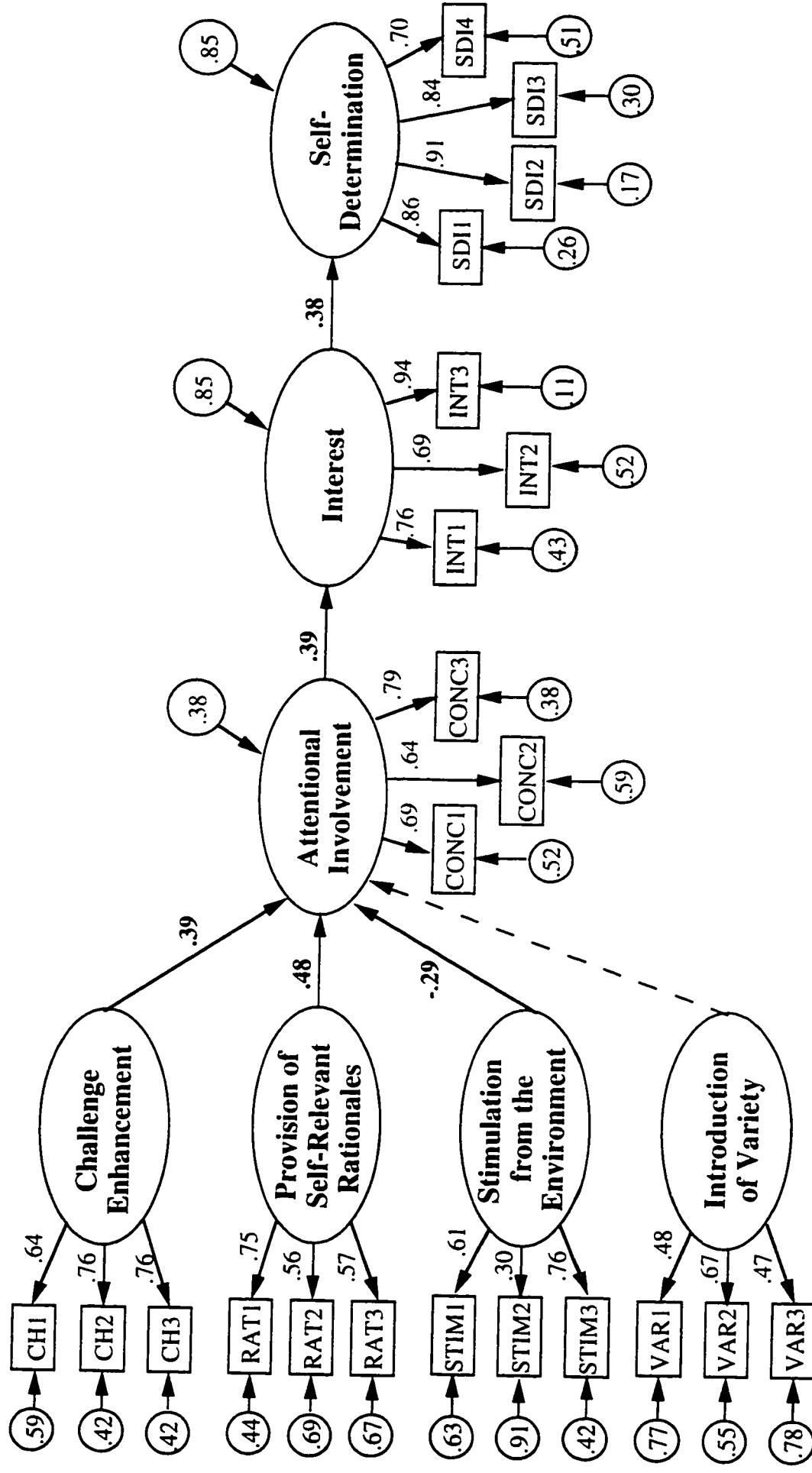


Figure 5. Revised Interest and Motivation Self-Regulation Model ($N=318$; Study 1). All the parameters in the model are standardized and significant at the .01 level. The non-significant path is indicated by a dashed arrow.

Table 6

Correlations (Phi Values) Between the Exogeneous Factors of the Revised Interest and Motivation Self-Regulation Model (Study 1)

Factors	CH	RAT	STIM	VAR
Challenge Enhancement (CH)	1.00			
Provision of Self-Relevant Rationales (RAT)	.56**	1.00		
Stimulation from the Environment (STIM)	--	.19*	1.00	
Introduction of Variety (VAR)	.85**	.73**	--	1.00

* $p < .05$

** $p < .01$

The magnitude of the regression coefficient was moderate, and interest predicted 15% ($p<.01$) of the variance of self-determination. Hence, higher levels of interest were associated with higher levels of self-determination. Finally, the estimated correlations between the exogeneous constructs were all significant, positive, and of acceptable magnitude (see Table 6).

In addition to their direct effects on attentional involvement, challenge enhancement, provision of self-relevant rationales, and stimulation from the environment, revealed significant indirect effects on attentional involvement, interest, and self-determination⁴. The indirect and total effects of the exogeneous constructs on the endogeneous constructs of the revised interest and motivation self-regulation model are reported in Table 7. These results indicated that attentional involvement mediated the impact of challenge enhancement, provision of self-relevant rationales and stimulation from the environment on interest, and on self-determination. In accordance with the direct effects, the indirect effects of challenge enhancement and provision of self-relevant rationales on interest and self-determination were positive. Conversely, the indirect effects of stimulation from the environment on interest and motivation were negative. Moreover, attentional involvement also displayed a significant and positive indirect effect on self-determination (Indirect effect=.15, $p<.01$; Total effect=.15, $p<.01$). Together, these findings supported the hypothesis that attentional involvement mediates the impact of the use of challenge enhancement, provision of self-relevant rationales, and stimulation from the environment, on interest and self-determination.

⁴ A direct effect is the unmediated impact of one variable on another. Direct effects correspond to the regression coefficients of the model. Indirect effects represent the mediating influence of at least one intervening variable (Bollen, 1989). Total effects are the sum of direct and indirect effects.

Table 7

Indirect and Total Effects of the Exogeneous Constructs on the Endogeneous Constructs
of the Revised Interest and Motivation Self-Regulation Model (Study 1)

	Attentional Involvement		Interest		Self- Determination	
	Indirect Effects	Total Effects	Indirect Effects	Total Effects	Indirect Effects	Total Effects
Challenge Enhancement	--	.39**	.15**	.15**	.06**	.06**
Provision of Self-Relevant Rationales	--	.48**	.19**	.19**	.07**	.07**
Stimulation from the Environment	--	-.29**	-.11**	-.11**	-.04**	-.04**
Introduction of Variety	--	--	--	--	--	--

** $p < .01$

Chapter Summary and Discussion

The goal of Study 1 was to create a model of interest and motivation self-regulation on the basis of the theoretical works of Sansone (1992), Deci (1985, 1991), and their colleagues. Thus, a model generating approach was adopted (Jöreskog, 1993). It was first hypothesized that students use the five proposed interest-enhancing strategies when they are faced with a boring academic task. Descriptive statistics obtained in the present study supported this hypothesis. Specifically, the mean levels of interest-enhancing strategy use revealed that students used challenge enhancement, provision of self-relevant rationales, attentional involvement, exploitation of stimulation, and introduction of variety, to a moderate extent when coping with boring academic tasks.

Second, a model was proposed wherein the five proposed interest-enhancing strategies were positively hypothesized to be associated with higher interest levels. Interest levels were, in turn, hypothesized to be positively associated with higher levels of self-determination. The model was tested using structural equation modeling. Albeit the fit of the resulting model was satisfactory, the only hypothesized path that was supported by the results was the path between interest and self-determination. None of the five interest-enhancing strategies were associated with interest levels. A revised model was formulated on the premises of logical, theoretical, and statistical considerations. That is, because several correlations were found between the five interest-enhancing strategies, the presence of a hierarchy amongst the strategies was suspected and the possibility that a strategy might mediate the impact of others was investigated. Intuitively, attentional involvement appeared to be the strategy that was most likely to mediate the impact of all other strategies on interest. Moreover, this strategy was the only one correlated with all five other strategies, and theoretically, it has been associated, in the

research literature, with pleasurable experiential components and with interest (Csikszentmihalyi, 1975, 1982).

The revised model hypothesized that challenge enhancement, provision of self-relevant rationales, stimulation from the environment, and introduction of variety, were positively associated with attentional involvement. Next, attentional involvement was hypothesized to be positively associated with interest. Interest, in turn, was hypothesized to be associated positively with self-determination. The results offered partial support for the revised model. Most significant paths were in accordance with the revised hypothesized model. Challenge enhancement, provision of self-relevant rationales, and stimulation from the environment, predicted attentional involvement. Attentional involvement predicted interest, and interest, in turn, predicted self-determination. Moreover, the significant indirect effects of challenge enhancement, provision of self-relevant rationales, and stimulation from the environment, on interest and self-determination, offered further support to the model. However, introduction of variety failed to predict attentional involvement. Although participants used this strategy to a moderate extent, it was unrelated to attentional involvement, to interest, and to self-determination. Also, the path between exploitation of stimulation and attentional involvement was unexpectedly negative, as were the indirect effects associated with exploitation of stimulation. Are these unexpected results a sample specific happenstance? Or do they reflect reality? More research is necessary to settle the issue.

In addition, it is important to acknowledge that the present study bears serious limitations. From a methodological point of view, the correlational nature of the design makes it impossible to rule out the eventuality of reverse or reciprocal causation between the variables. Also, because little control was exerted on outwards sources of influence, the results could reflect the impact of unknown factors. From a statistical point of view, though the modifications to the model were performed on the grounds of substantive and statistical

criteria, the satisfactory fit of the revised model, and/or the emergence of satisfactory and significant paths, could result from sample-specific chance fluctuations in the data (MacCallum, Roznowski, & Necowitz, 1992). Thus, the present findings are best viewed as tentative and additional research is needed to support their validity.

To summarize, the goal of the present study was to build an interest and motivation self-regulation model. After the hypothesized model was deemed unsatisfactory, a revised model was designed and tested. The results mostly supported the revised model, even though introduction of variety was non-significant, and exploitation of stimulation displayed an unexpected negative association with attentional involvement. Albeit intriguing, the present results are exploratory in nature. Accordingly, the revised interest and motivation self-regulation model will be further investigated in Study 2.

CHAPTER THREE

STUDY 2

Cross-Validation of the Interest and Motivation Self-Regulation Model

The goal of Study 2 was to replicate the results obtained in Study 1. Like Study 1, Study 2 was performed in the context of undergraduate university courses, by the means of a questionnaire survey. Again, three main categories of variables were surveyed: Interest-enhancing strategies, interest towards an uninteresting academic task, and academic motivation. The objective of Study 2 was to cross-validate the revised interest and motivation self-regulation model yielded by post hoc analyses in Study 1. The conceptual hypothesized model is presented in Figure 6. The research hypotheses were formulated in line with the results of Study 1. It was first hypothesized that students resort to challenge enhancement, provision of self-relevant rationales, stimulation from the physical environment, introduction of variety, and attentional involvement, when coping with less-interesting academic tasks. Second, it was hypothesized that the use of challenge enhancement, provision of self-relevant rationales, and stimulation from the environment is associated with the use of attentional involvement. Introduction of variety was hypothesized to be unrelated to attentional involvement. The relationship between challenge enhancement and attentional involvement, as well as the relationship between provision of self-relevant rationales and attentional involvement, were hypothesized to be positive. Conversely, the relationship between stimulation from the environment and attentional involvement was hypothesized to be negative. Third, frequent use of attentional involvement was, in turn, hypothesized to be associated with higher levels of interest. Finally, higher interest levels were hypothesized to be associated with greater levels of self-determination.

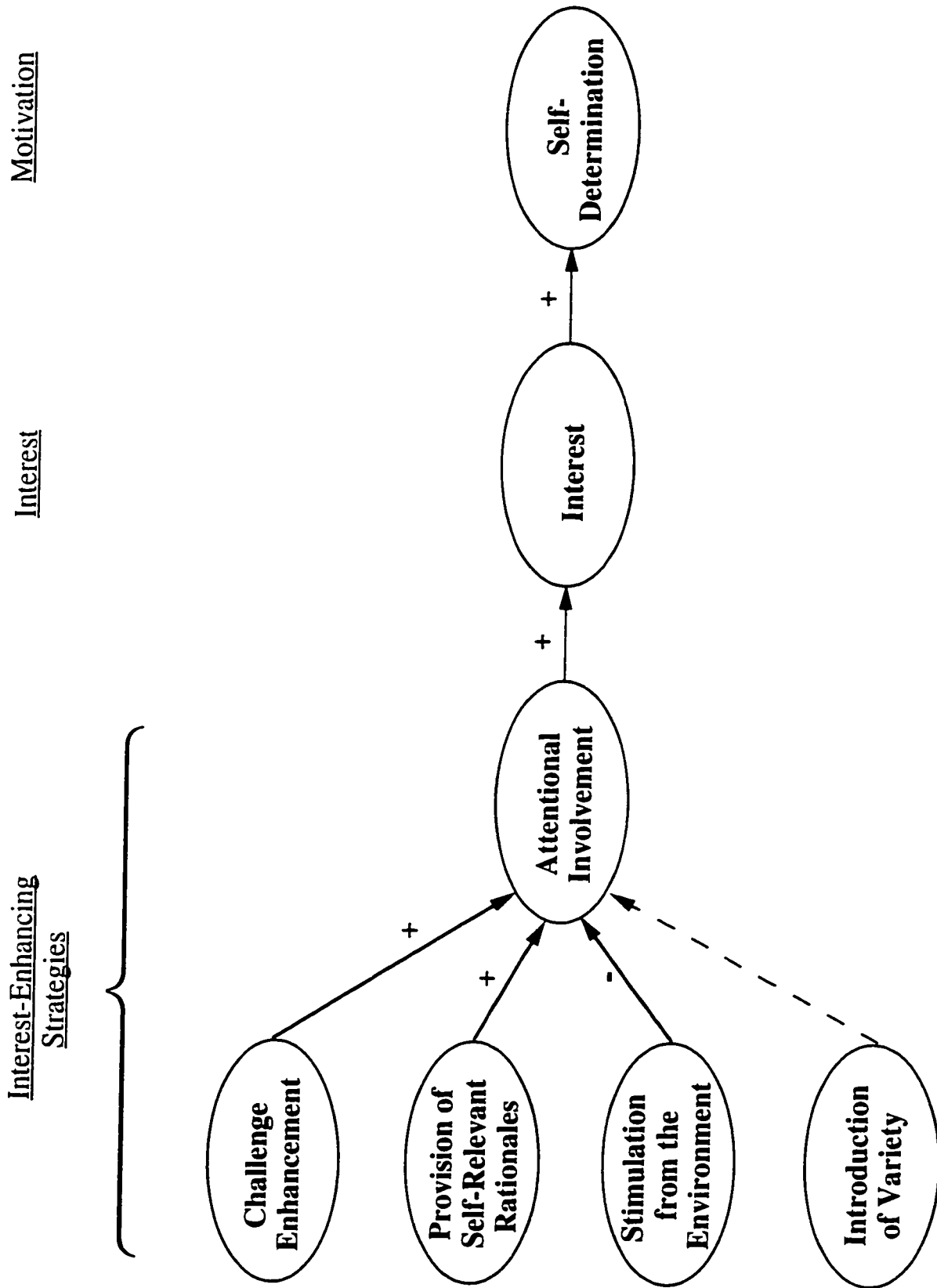


Figure 6. *Hypothesized Interest and Motivation Self-Regulation Model (Study 2)*

Because the goal of Study 2 was to replicate the findings of Study 1, the research design and methodological procedures of both studies were largely similar. Yet, a minor adjustment was performed in the measurement procedure of Study 2. In Study 1, interest levels were measured for three uninteresting academic tasks, and these three measures served as indicators for the latent construct representing interest. However, in Study 2, a single uninteresting task was retained and multiple items were designed to measure interest towards this unique task. This was accomplished to better control the validity of the results. Specifically, two of the three tasks surveyed in Study 1 referred to evaluation procedures (i.e., studying for exams and writing exams). A number of factors (e.g., stress, evaluation apprehension, pressure, etc.) are known to influence interest and motivation in such situations. To ensure that no such confounding variables interfered with the assessment of the interest and motivation self-regulation model, in Study 2, interest measures targeted a single non-threatening task: routine studying.

Method

Participants and Procedure

Participants ($N=459$) were recruited in different courses offered by the Faculty of Social Sciences. Several participants (20%) failed to provide the totality of the information necessary for the analyses. Sixteen participants were excluded from the sample because their questionnaires revealed sets of adjacent missing values. The remaining 77 cases with missing data were retained since these cases presented only a few missing random data points. That is, the distribution of missing values within the cases, and between the variables, did not present any recognizable pattern. For the 77 participants with random missing data, the sample mean was utilized to replace missing values for each item of the research questionnaire. Finally, four cases presenting clear response sets were excluded from the sample.

The sample ($N=439$) included 142 men, 288 women, and 9 participants that omitted to report their gender. The participants' age ranged from 17 to 63 years ($M=23$ years; $SD=5.40$). Albeit a small proportion of students (4%) reported studying on a part-time basis, most participants were enrolled with full-time status. The self-reported grade point average of the participants ranged from 3.0 to 10.0, on a 10 point scale ($M=6.58$; $SD=1.45$), and its distribution was approximately normal (kurtosis=-.12; skewness=-.14).

With the permission of the professor, the participants completed the questionnaires during class time. It took about 20 minutes to fill out the research survey. The questionnaire package comprised: (a) an introduction letter explaining the goal of the study and outlining the participants rights in accordance with standard ethical procedures, (b) a measure of participants' motivation towards the course in which they were surveyed, (c) a measure of participants' level of interest towards routine studying in the course in which they were surveyed, (d) a measure of the occurrence of interest-enhancing strategy use when coping with

routine studying, and (e) demographic questions. The introduction letter and the questionnaire package can be found in Appendix C.

Measures

As in Study 1, *interest-enhancing strategy use* was assessed using the Interest-Enhancing Strategies Scale (Green-Demers et al., 1994), and *academic motivation* was measured using the adapted version of the Academic Motivation Scale (Vallerand et al., 1992, 1993). Please refer to the "Measures" subsection of the "Method" section of Study 1, for a complete description of the psychometric qualities of these two instruments. Here again, four global self-determination indices were generated by summing the scores on the subscales of the AMS using the following equation: $SDI = ((2INTEG) + (IDEN) - (ER) - (2AMO))$.

Interest towards an uninteresting academic task. In the present study, interest levels pertained to a unique uninteresting academic task: Routine studying. Routine studying referred to the revision and study of class notes and readings that is necessary to stay up to date with the course material. On the basis of the subdimensions of interest proposed by Berlyne (1960), four items were designed to assess interest towards routine studying: (a) How interesting do you generally find routine studying in this course? (b) How novel is the material you cover when you do routine studying in this course? (c) Is there a lot of variety in the material you cover when you do routine studying for this course? (d) How curious do you feel towards the material you cover when you do routine studying in this course? In the present study, these four items displayed an internal consistency value (Cronbach's alpha) of .68.

Analyses

As in Study 1, data analyses were accomplished in three steps: (a) preliminary analyses, (b) descriptive analyses, and (c) structural equation modeling procedures. This final

step was itself composed of two stages: Estimation of the measurement model and estimation of the hypothesized model. Again, structural equation modeling procedures were performed using the program LISREL VIII (Jöreskog & Sorbom, 1996a, 1996b). For a description of the options favored in the selection of the estimation procedure, the analyzed matrix type, and the assessment of model fit, please refer to the "Analyses" subsection of the "Method" section of Study 1.

Results

Preliminary Analyses

Absence of outliers. The standardized scores for all the variables included in the model were screened to identify univariate outliers. No cases revealed standardized scores greater than 131. Multivariate standardized residuals, leverage, and Mahalanobis' and Cook's distances were computed to detect multivariate outliers. Multivariate standardized residuals revealed acceptable values, ranging from -1.92 to 2.27. There were no Cook's distances in excess of 1.00 (Hamilton, 1992), and no leverage values above .20 (Huber, 1981). However, five cases (1%) displayed significant Mahalanobis' distances ($\chi^2_{(df=23)} > 49.73, p < .001$). These participants were excluded from subsequent analyses, yielding a final sample size of 434.

Sample size. The present sample size ($N=434$) is superior to the minimum of 200 participants required for structural equation modeling (Ullman, 1996). Thus, it is deemed satisfactory for the purposes of the present study.

Normality. The summary statistics of all the variables of the interest and motivation self-regulation model were first examined. Table 8 presents the means, standard deviations, kurtosis, and skewness values, of these variables. The means and standard deviation values revealed that the variables under study displayed acceptable dispersion. Kurtosis values ranged

Summary Statistics for the Indicators of the Interest and Motivation Self-Regulation Model (Study 2)

Variable	Mean	Standard Deviation	Kurtosis	Skewness
Challenge Enhancement (CH)	16.07	5.53	-.51	-.32
CH1	4.01	2.27	-1.04	.19
CH2	6.12	2.25	-.34	-.76
CH3	5.94	2.26	-.51	-.57
Provision of Rationales (RAT)	14.75	5.17	-.41	-.18
RAT1	5.45	2.17	-.56	-.42
RAT2	4.22	2.43	-1.08	.22
RAT3	5.08	2.24	-.88	-.31
Attentional Involvement (ATT)	17.36	4.55	-.33	-.15
ATT1	5.95	2.00	-.29	-.53
ATT2	6.16	1.74	-.36	-.36
ATT3	5.26	1.97	-.56	-.07
Stimulation from the Environment (STIM)	14.72	6.10	-.69	-.12
STIM1	4.60	2.55	-1.22	.11
STIM2	4.70	2.88	-1.45	.06
STIM3	5.42	2.76	-1.30	-.32
Introduction of Variety (VAR)	14.51	4.43	-.41	-.12
VAR1	4.78	2.41	-1.11	-.14
VAR2	4.75	2.09	-.73	.03
VAR3	4.97	2.04	-.52	-.22
Interest (INT)	20.16	5.10	-.11	-.06
INT1	4.29	1.71	-.35	.07
INT2	5.08	1.68	-.11	-.07
INT3	5.38	1.79	-.30	-.15
INT4	5.41	1.94	-.50	-.33
Self-Determination (SD)	26.67	33.55	-.05	-.54
SD1	4.87	9.90	-.15	-.32
SD2	4.33	9.50	.01	-.51
SD3	9.56	8.55	.31	-.67
SD4	7.91	10.27	-.54	-.43

Note. The theoretical range is 1 to 9 for all individual items except self-determination, which range from -24 to +24. The theoretical range is 3 to 27 for all global scores, except interest and self-determination. The theoretical range is 4 to 36 for the global interest score, and -96 to +96 for the global self-determination score.

from -1.45 to .31, while skewness values ranged from -.76 to .22. Despite a few high values, univariate values of kurtosis and skewness were generally deemed adequate since mean kurtosis ($|M|=.62$) and mean skewness ($|M|=.30$) were below 1.00 (Muthén & Kaplan, 1985). Overall, examination of summary statistics provided no reason to suspect that the distribution of the variables departed significantly from normality. Also, from a multivariate point of view, the distribution of standardized residuals appeared approximately normal.

Linearity. Potential departures from linearity were screened for by examining a random selection of bivariate scatterplots. Overall, the bivariate distributions revealed linear configurations. Moreover, as previously mentioned, the distribution of the standardized multivariate residuals appeared approximately normal.

Homoscedasticity. The bivariate scatterplots were also inspected to identify uneven distributions of the variance between the pairs of variables. The scattergrams displayed no evidence of heteroscedasticity.

Absence of multicollinearity. The correlations between all possible pairs of variables included in the analyses were scanned for multicollinearity. No correlations above .90 were detected.

Descriptive Statistics

Interest-enhancing strategies. The interest-enhancing strategies that were the most frequently used by the students were attentional involvement ($M=17.36$, $SD=4.55$) and challenge enhancement ($M=16.07$, $SD=5.53$), followed by provision of self-relevant rationales ($M=14.75$, $SD=5.17$), exploitation of stimulation from the physical context ($M=14.75$, $SD=5.54$), and introduction of variety ($M=14.51$, $SD=4.43$). Considering that the theoretical range of global strategy use scores was 3 to 27, the students employed the five interest-enhancing strategies to a moderate extent when coping with an uninteresting academic task.

Interest towards routine studying. The mean interest level for routine studying was 20.16 ($SD=5.10$). The theoretical range for this global interest score varied from 4 to 36. Therefore, students did not find that routine studying was a very interesting academic task.

Self-determination. The sum of the four self-determination indices ranged from -80.00 to +93.00, with an average of 26.67 ($SD=33.55$). The theoretical range for the global self-determination score was -96.00 to +96.00. Thus, the mean level of self-determination in the sample was positive, but of small magnitude, and the self-determination scores were normally distributed on either side of the mean (kurtosis=-.05; skewness=-.54).

Sex differences. As reported in Table 9, men and women presented significant differences on three of the variables included in the model. Specifically, men used challenge enhancement and introduction of variety significantly less often than women. Also, women displayed significantly higher levels of self-determination than men.

Structural Equation Modeling

Testing the measurement model. A first CFA was performed for the Interest Enhancing Strategies Scale (IESS). The items composing each subscale of the IESS served as the observed indicators of the underlying latent factors. First, it was hypothesized that the responses on the IESS were explained by five factors, corresponding to the five subscales of the IESS. That is, the items of the IESS were hypothesized to display significant and substantial loadings on their target factors, and zero loadings on all other factors. Second, the factors were hypothesized to be correlated, since it seemed plausible that participants would not limit themselves to the use of a single interest-enhancing strategy. Third, the error variance associated with each item was hypothesized to be small, yet significant, and its uniqueness component to be uncorrelated with that of any other item. Finally, for identification purposes, the loadings between the first indicator of each latent construct and its target factor were fixed

Table 9

Comparison of the Means of Interest-Enhancing Strategies, Interest, and Self-Determination for Men and Women (Study 2)

Subscale	Mean (SD)		t-Value (df=423)	Probability
	Men (n=139)	Women (n=286)		
Challenge Enhancement	14.74 (5.99)	16.75 (5.18)	-3.38	.001*
Provision of Self-Relevant Rationales	14.37 (5.02)	14.94 (5.25)	-1.07	.535
Attentional Involvement	17.06 (4.67)	17.48 (4.47)	-.90	.469
Stimulation from the Environment	14.07 (6.50)	15.04 (5.88)	-1.55	.123
Introduction of Variety	13.55 (4.58)	15.04 (4.23)	-3.33	.001*
Interest	19.51 (5.32)	20.43 (5.01)	-1.74	.529
Self-Determined Extrinsic Motivation	18.08 (33.15)	30.80 (33.23)	-3.70	.001*

Note. The Levene's test for equality of variance revealed no significant differences for the pairs of means compared above, except for challenge enhancement. Consequently, a t-test for groups with unequal variances was utilized for challenge enhancement ($df=241.37$), and t-tests for groups with equal variances were performed for all other variables ($df=423$). The Bonferroni correction was employed to control for the number of comparisons ($p=.05/7$ t-tests = .007). Significant probabilities are indicated by an asterisk.

to 1.0. The results supported the hypotheses. The model displayed an acceptable fit ($\chi^2_{(80, N=434)}=183.82, p<.001$; RMSEA=.05; GFI=.95; CFI=.92; PCFI=.70). Moreover, the estimated parameters were significant and within an acceptable range.

A second CFA was performed on the four items designed to assess interest towards routine studying. First, it was hypothesized that the responses on the interest items were explained by a single factor. Thus, the items were hypothesized to display significant and substantial loadings on this factor. Second, the error variance associated with each item was hypothesized to be small, yet significant, and its uniqueness component to be uncorrelated with that of any other item. Finally, for identification purposes, the loading between the first item and the interest factor was fixed to 1.0. The results supported the hypotheses. The estimated parameters were generally significant and within an acceptable range. Moreover, albeit the RMSEA and PCFI had out-of-range values, the model was deemed to display a satisfactory fit ($\chi^2_{(2, N=434)}=10.24, p<.001$; RMSEA=.10; GFI=.99; CFI=.97; PCFI=.32). RMSEA values should be inferior to .08 (Browne & Cudeck, 1993), and PCFI values superior to .50 (Mulaik et al., 1989), when the model presents an acceptable fit to the data. Yet, in the context of the present analysis, it is likely that the unacceptable RMSEA and PCFI values reflect poor parsimony, rather than actual misfit between the model and the sample covariance. That is, the RMSEA and the PCFI both include penalties for poor parsimony, and, within the results of the present analysis, the indices that ignore parsimony considerations (e.g., GFI, CFI) revealed satisfactory values. Thus, as indicated by the small number of degrees of freedom, and as reflected in the RMSEA and the PCFI, the model was not parsimonious. However, as mentioned in Study 1, this was not considered a problem because the goal of the procedure was to identify areas of misfit within the measurement of interest.

A third and final CFA was performed on the four indices designed to assess self-determination. First, it was hypothesized that the responses on the self-determination

indicators were explained by a single factor. Thus, the indicators were hypothesized to display significant and substantial loadings on this factor. Second, the error variance associated with each indicator was hypothesized to be small, yet significant, and its uniqueness component to be uncorrelated with that of any other indicator. Finally, for identification purposes, the loading between the first indicator and the self-determination factor was fixed to 1.0. The results supported the hypotheses. The model displayed a satisfactory fit ($\chi^2_{(2,N=434)}=6.17$, $p=.05$; RMSEA=.07; GFI=.99; CFI=1.00; PCFI=.33). Moreover, the estimated parameters were generally significant and within an acceptable range. Again, as indicated by the small number of degrees of freedom, and by the PCFI, the model was not parsimonious. However, this was not considered a problem because the goal of the procedure was to identify areas of misfit within the measurement of self-determination.

Testing the hypothesized model. As previously specified, the hypothesized model is depicted in Figure 6 (see p. 70). The measurement submodel was specified in accordance with the results reported in the previous section. The statistical hypotheses corresponding to the structural portion of the model are described below. First, the regression coefficients of attentional involvement on challenge enhancement, provision of self-relevant rationales, and stimulation from the environment, were hypothesized to be substantial, and significant. The regression coefficients of attentional involvement on challenge enhancement and provision of self-relevant rationales were hypothesized to be positive, while the regression coefficient of attentional involvement on stimulation from the environment was hypothesized to be negative. The path between introduction of variety and attentional involvement was hypothesized to be non-significant. Second, the regression coefficients of interest on attentional involvement were hypothesized to be substantial, positive, and significant. Third, the regression coefficient of self-determination on interest was hypothesized to be substantial, positive, and significant. Fourth, the residuals representing the error of prediction of all

regression equations were hypothesized to be significant, and the covariance between these residuals was hypothesized to be zero. Fifth, the exogeneous factor correlations were hypothesized to be substantial, positive, and significant.

The covariance matrix obtained from the observed data is presented in Appendix D. An illustration of the resulting model is presented in Figure 7. Because of space constraints, the correlations between the exogeneous factors are displayed separately, in Table 10. Model estimation yielded a satisfactory fit ($\chi^2_{(219, N=434)}=466.90, p<.001$; RMSEA=.05; GFI=.91; CFI=.92; PCFI=.80). The RMSEA and the CFI were within an acceptable range. The GFI revealed that the model explained 91% of the sample covariance. Also, the PCFI indicated that the model presented a satisfactory degree of parsimony.

Moreover, most hypothesized paths are supported by the results. Specifically, challenge enhancement and provision of self-relevant rationales predicted attentional involvement significantly, the magnitude of these regression coefficients was moderate, and their valence was positive. Thus, a more frequent use of challenge enhancement and provision of self-relevant rationales was associated with a more frequent use of attentional involvement. Here again, the path between introduction of variety and attentional involvement was non-significant, and the regression of attentional involvement on stimulation from the environment yielded a small, significant, and negative coefficient. That is, a more frequent recourse to the stimulation from the physical environment was associated with less frequent attempts to involve one's attention on the task. Together, challenge enhancement, provision of self-relevant rationales, and stimulation from the environment predicted a substantial proportion of the variance of attentional involvement ($R^2=.51, p<.01$). Attentional involvement, in turn, predicted interest significantly. The magnitude of the regression coefficient was moderate and attentional involvement predicted a modest, yet significant, proportion of the variance of interest ($R^2=.19, p<.01$). Thus, a more frequent use of attentional involvement was associated

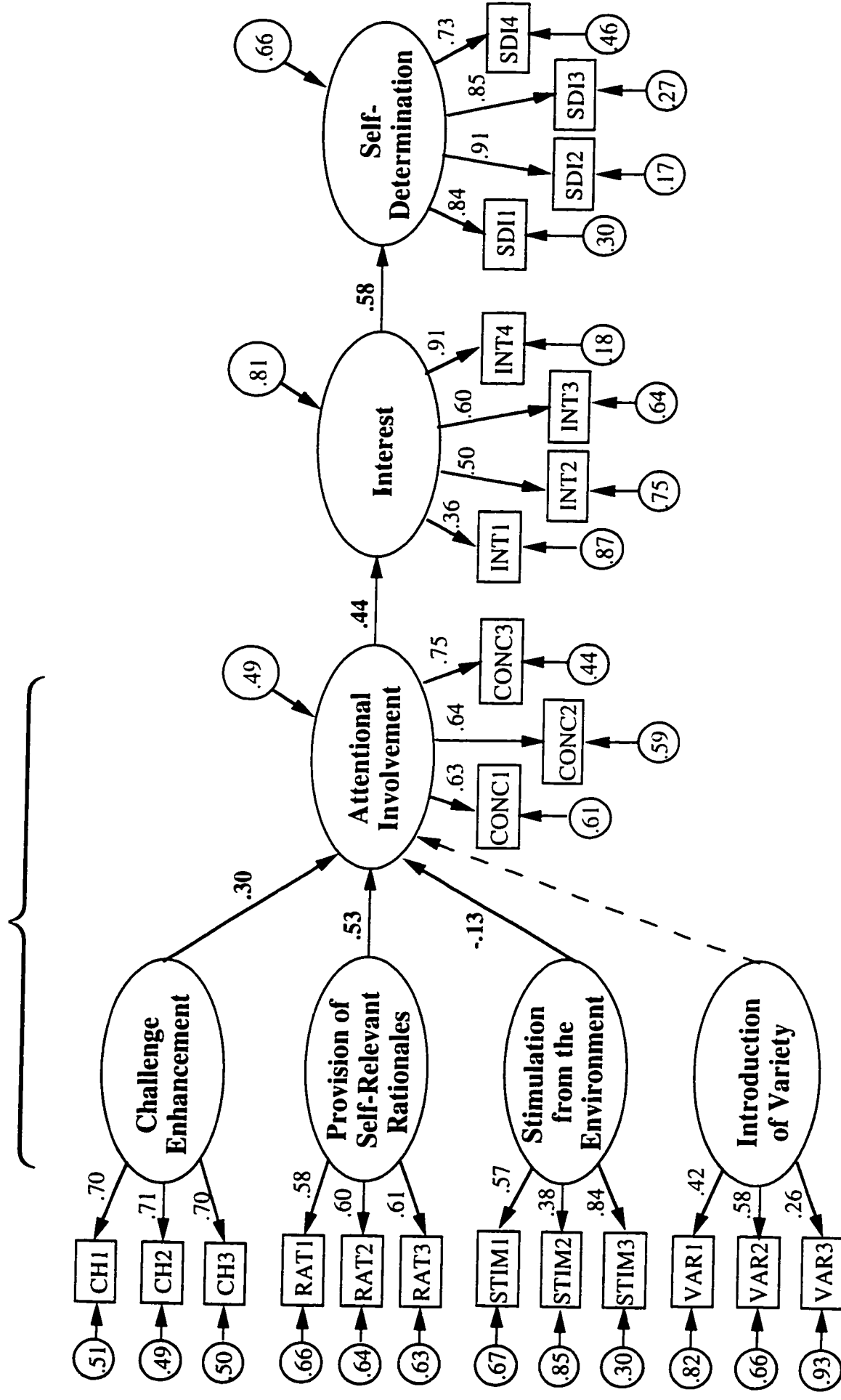


Figure 7. Interest and Motivation Self-Regulation Model (Study 2; N=434). All the parameters in the model are standardized and significant at the .01 level. The non-significant path is indicated by a dashed arrow.

Table 10

Correlations (Phi Values) Between the Exogeneous Factors of the Interest and Motivation Self-Regulation Model (Study 2)

Factors	CH	RAT	STIM	VAR
Challenge Enhancement (CH)	1.00			
Provision of Self-Relevant Rationales (RAT)	.58**	1.00		
Stimulation from the Environment (STIM)	.18**	.29**	1.00	
Introduction of Variety (VAR)	.71**	.74**	.36**	1.00

** $p < .01$

with higher levels of interest. Next, interest levels predicted self-determination significantly. The magnitude of the regression coefficient was moderate, and interest predicted 34% ($p < .01$) of the variance of self-determination. Hence, higher levels of interest were associated with higher levels of self-determination. Finally, the estimated correlations between the exogenous constructs were all significant, positive, and of acceptable magnitude (see Table 10).

In addition to their direct effects on attentional involvement, challenge enhancement and provision of self-relevant rationales displayed significant indirect effects on attentional involvement, interest, and self-determination. The indirect and total effects of the exogenous constructs on the endogenous constructs of the revised interest and motivation self-regulation model are reported in Table 11. These results indicated that attentional involvement mediated the impact of challenge enhancement, provision of self-relevant rationales and stimulation from the environment on interest, and on self-determination. The indirect effects of challenge enhancement and provision of self-relevant rationales on interest and self-determination were positive. The indirect effects of stimulation from the environment on interest and motivation were non-significant. Moreover, attentional involvement also displayed a significant and positive indirect effect on self-determination (Indirect effect = .25, $p < .01$; Total effect = .25, $p < .01$). Together, these findings supported the hypothesis that attentional involvement mediates the impact of the use of challenge enhancement and provision of self-relevant rationales on interest and self-determination.

Table 11

Indirect and Total Effects of the Exogeneous Constructs on the Endogeneous Constructs
of the Revised Interest and Motivation Self-Regulation Model (Study 2)

	Attentional Involvement		Interest		Self- Determination	
	Indirect Effects	Total Effects	Indirect Effects	Total Effects	Indirect Effects	Total Effects
Challenge Enhancement	--	.23**	.05**	.05**	.10**	.10**
Provision of Self-Relevant Rationales	--	.53**	.11**	.11**	.22**	.22**
Stimulation from the Environment	--	-.11*	-.02	-.02	-.05	-.05
Introduction of Variety	--	--	--	--	--	--

* $p < .05$ ** $p < .01$

Chapter Summary and Discussion

Study 2 aimed to replicate the results obtained in Study 1. Specifically, the objective of Study 2 was to cross-validate the revised interest and motivation model yielded by the a posteriori respecifications performed in Study 1. As in Study 1, it was first hypothesized that students resort to challenge enhancement, provision of self-relevant rationales, stimulation from the physical environment, introduction of variety, and attentional involvement, when coping with less-interesting academic tasks. In accordance with the results of Study 1, descriptive statistics indicated that students used challenge enhancement, provision of self-relevant rationales, attentional involvement, exploitation of stimulation and introduction of variety, to a moderate extent when faced with an uninteresting academic task.

Second, on the basis of the results of Study 1, it was hypothesized that the use of challenge enhancement, provision of self-relevant rationales, and stimulation from the environment was associated with the use of attentional involvement. The path between challenge enhancement and attentional involvement, as well as the path between provision of self-relevant rationales and attentional involvement, was hypothesized to be positive. Alternatively, the path between exploitation of stimulation and attentional involvement was hypothesized to be negative. Introduction of variety was hypothesized to be unrelated to attentional involvement. Next, attentional involvement was hypothesized to be positively associated with interest. Interest, in turn, was hypothesized to be positively associated with self-determination. The model was tested using structural equation modeling.

The results offer supported for the hypothesized model. All hypothesized paths were significant. Challenge enhancement, provision of self-relevant rationales, and stimulation from the environment, predicted attentional involvement. As in Study 1, the paths between challenge enhancement and attentional involvement, and between provision of self-relevant

rationales and attentional involvement were positive. Also, the path between exploitation of stimulation and attentional involvement had a negative valence. This unexpected finding carried across samples. A more frequent use of exploitation of stimulation was associated with a less frequent use of attentional involvement. This makes intuitive sense because attending to stimulation from the physical environment is incompatible with involving one's attention in the target task. Hence, although participants resorted to exploitation of stimulation in an attempt to cope with the boring task, the use of this strategy appeared counterproductive. Attentional involvement predicted interest positively, and higher interest, in turn, predicted greater self-determination. In agreement with the results of Study 1, introduction of variety was unrelated to attentional involvement. Thus, even though this strategy was utilized to a moderate extent by the participants, it was unrelated to possible positive consequences. Finally, the presence of significant indirect effects offered further support to the model. No a posteriori modifications were performed to obtain these results. The revised interest and motivation model has been successfully cross-validated using a strictly confirmatory approach (Jöreskog, 1993).

However, as in Study 1, several limitations apply to the results of the present study. Again, from a methodological point of view, the correlational nature of the design makes claims about the direction of causal relationships impossible. In addition, no control was exerted on extraneous factors, and the results could be contaminated by confounding influences. From a psychometric perspective, an attempt was made, in the present study, to better control the validity of the interest measure by targeting a unique, non-threatening academic task, namely routine studying. Yet, the reliability of the four items designed to measure interest towards routine studying was somewhat low ($\alpha=.68$). This might have affected the power of the analyses.

In sum, the goal of the present study, which was to cross-validate the results of Study 1, was achieved. Nevertheless, the correlational status of the design limits the conclusions that

can be drawn from the results. Now that it has been established that the results of Study 1 are unlikely to origin from capitalization on chance variability within the data, additional research using more rigorous methodological procedures is required to further support the validity of the interest and motivation self-regulation model.

CHAPTER FOUR

STUDY 3

A Longitudinal Assessment of the Interest and Motivation Self-Regulation Model

In Study 3, the interest and motivation self-regulation model was tested using a longitudinal research design. Study 1 yielded a plausible interest and motivation self-regulation model. This model was further supported by the results of Study 2. However, due to the cross-sectional nature of the correlational design of these studies, it is not possible to make strong claims about the direction of the causal relationships comprising the interest and motivation self-regulation model. The results of Study 1 and 2 demonstrated that interest-enhancing strategy use, interest, and motivation, covary when they are measured in the context of a single testing session. Those results are encouraging because they support the notion that the current use of four strategies is related directly or indirectly to present levels of interest, and that actual levels of interest entertain a relationship with existent levels of self-determination. But do these relationships hold over time? Most importantly, can interest-enhancing strategy use predict future levels of interest and motivation? The goal of Study 3 was to address these questions. Like Study 1 and Study 2, Study 3 was performed, by the means of a questionnaire survey, in the context of undergraduate university courses. Here again, three main categories of variables were assessed: Interest-enhancing strategies, interest towards an uninteresting academic task (i.e., routine studying), and academic motivation. These variables were measured at two points in time, at a 10 week time interval. The research hypotheses were formulated on the basis of the results of Study 1 and Study 2. The conceptual hypothesized model is presented in Figure 8. First, it was hypothesized that students utilize challenge enhancement, provision of self-relevant rationales, stimulation from the physical environment, introduction of variety, and attentional involvement, when they have to perform an

Interest-Enhancing
Strategies (Time 1)

Interest

Motivation

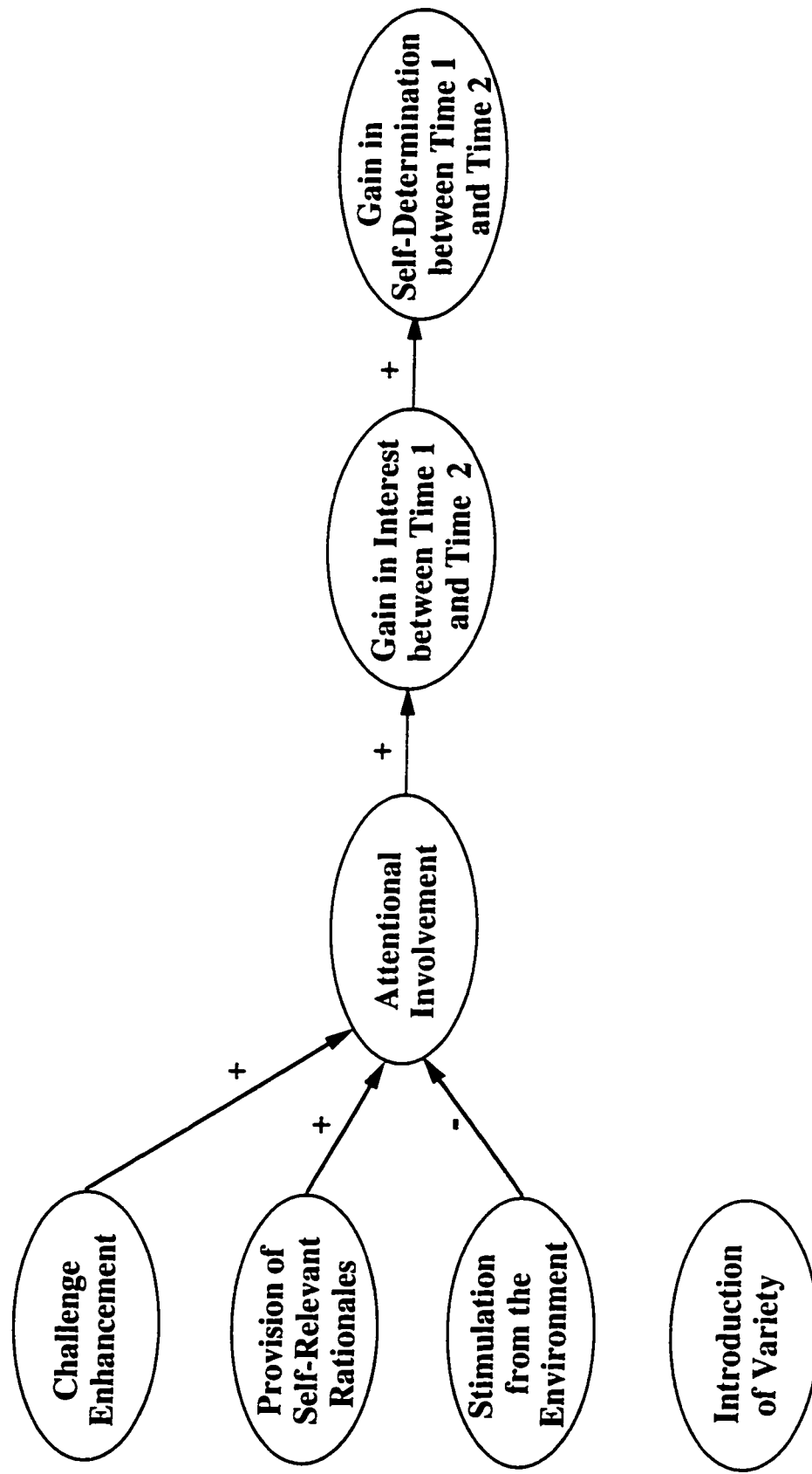


Figure 8. Hypothesized Longitudinal Interest and Motivation Self-Regulation Model (Study 3)

uninteresting academic task. Second, it was hypothesized that the use of challenge enhancement, provision of self-relevant rationales, and stimulation from the environment is associated with the use of attentional involvement at Time 1. The relationship between challenge enhancement and attentional involvement, and the relationship between provision of self-relevant rationales and attentional involvement, were hypothesized to be positive. Conversely, the relationship between stimulation from the environment and attentional involvement was hypothesized to be negative. Introduction of variety was hypothesized to be unrelated to attentional involvement. Third, frequent use of attentional involvement at Time 1 was, in turn, hypothesized to be associated with gains in interest between Time 1 and Time 2. Finally, gains in interest were hypothesized to be associated with gains in self-determination between Time 1 and Time 2.

The assessment of change is a methodological and statistical challenge. For instance, problems such as the accumulation of measurement error (e.g., Burr & Nesselroade, 1990; Cronbach & Furby, 1970), spurious correlation between baseline and change scores (e.g., Linn & Slinde, 1977; Lord, 1963), and regression towards the mean (e.g., Jamieson, 1995; Nesselroade, Stigler, & Baltes, 1980) are common, and possible solutions to these problems remain the focus of much debate (see Bereiter, 1963, Burr & Nesselroade, 1990, Cronbach & Furby, 1970, and Nesselroade, 1991, for literature reviews on this topic). In the present study, the data were analyzed using a leading edge procedure: The structural modeling of the base-free measurement of change (Raykov, 1992a, 1992b, 1993).

In addition, the research questionnaire was completed once, at Time 2, by participants included in a control group. The frequency of interest-enhancing strategy use in the control and the experimental groups were compared to assess whether rating the frequency of interest-enhancing strategy use at Time 1 induced the research participants of the experimental group to

use these strategies more frequently thereafter, thus creating a "carry over" effect likely to affect their responses at Time 2.

Because the goal of Study 3 was to provide a longitudinal replication of the results of Study 1 and Study 2, the measurement instruments used in Study 3 were largely similar to those of Study 1 and 2. However, improved versions of the interest-enhancing strategy use and interest measures were utilized in the hope of improving the reliability of the results.

Method

Participants

Experimental group. The participants were recruited in a variety of undergraduate courses offered by the Faculty of Social Sciences. A total of 705 students were surveyed at Time 1. Three hundred and thirty five participants failed to complete the questionnaire at Time 2, resulting in a 48% attrition rate⁵. Of the remaining 370 questionnaires, 52 contained missing data (14%). Sixteen cases, which presented series of adjacent missing values, were deleted from the sample. The remaining 36 cases with missing data were retained since these cases presented only a few missing random data points. Specifically, the distribution of missing values within the cases, and between the variables, did not present any recognizable pattern. The sample mean was used to replace missing values for each item of the research questionnaire for the 36 cases with random missing data. A comparison of the means as evaluated by Bonferroni t-tests revealed no significant differences in the use of interest-enhancing strategies, interest, and self-determination (at Time 1), between the participants that dropped out of the study ($n=335$) at Time 2, and the participants that completed the questionnaire at both time points.

The sample ($N=354$) included 93 men, 249 women, and 2 participants that did not report their gender. The participants' age ranged from 17 to 51 years ($M=21.10$; $SD=5.27$). Most participants were full time students, although a minority reported being enrolled with part-time status (11%). The self-reported grade point average of the participants ranged from 1.6 to 10.0, on a 10 point scale ($M=6.77$; $SD=1.84$), and its distribution was approximately normal (kurtosis=.25; skewness=-.82).

⁵ The high attrition rate resulted from the low attendance, at Time 2, in the courses in which the participants were recruited.

Control group. Again, participants were recruited in different courses offered by the Faculty of Social Sciences. A total of 178 participants completed the research survey. Nine participants (5%) omitted to provide the totality of the information necessary for the analyses. Of these 9 cases, 4 were excluded from the sample because their questionnaires contained sets of adjacent missing values. The remaining 5 cases with missing data were retained since they presented only a few missing random values. For these 5 cases, the sample mean was substituted for the missing data points.

The control group ($N=174$) comprised 50 men, 116 women, and 8 participants that omitted to report their gender. The participants' age ranged from 17 to 52 years ($M=22.03$, $SD=5.86$). While a few participants reported studying on a part-time basis (10%), most students were enrolled with full-time status. The self-reported grade point average of the participants ranged from 2.5 to 10.0 ($M=6.44$; $SD=1.67$), and its distribution was approximately normal (kurtosis=-.37; skewness=-.46)

Procedure. The participants completed the questionnaires during class time, with the permission of the professor. Completing the research survey took approximately 20 minutes. The questionnaire package comprised: (a) an introduction letter explaining the goal of the study and outlining the participants rights in accordance with standard ethical procedures, (b) a measure of participants' motivation towards the course in which they were surveyed, (c) a measure of participants' level of interest towards routine studying in the course in which they were surveyed, (d) a measure of the frequency of interest-enhancing strategy use when coping with routine studying, and (e) demographic questions. The introduction letter and the questionnaire package can be found in Appendix E. Participants in the experimental group completed the questionnaire package twice, at a ten week interval. Participants in the control group filled out the same questionnaire package once, at Time 2.

Measures

Interest-enhancing strategy use. Interest-enhancing strategy use was assessed using an improved version of the Interest-Enhancing Strategies Scale (IESS; Green-Demers et al., 1994). Please refer to the "Measures" subsection of the "Method" section of Study 1 for a description of the psychometric qualities of the original version of the IESS. In the present study, 5 new items were added to the original version of the IESS (1 item/subscale): (a) I establish an ambitious work schedule and I challenge myself to stick to it (challenge enhancement), (b) I try to remind myself of the reasons why the task is important to me (self-relevant rationales), (c) I try to get totally wrapped up in what I'm doing (attentional involvement), (d) I listen to music while I perform the task (exploitation of stimulation), and (e) I alternate less-interesting tasks with one another (introduction of variety). Thus, the new version of the IESS contained 20 items (4 items/subscale). In the present study, the internal consistency values (Cronbach's alpha) of the new version ranged from .65 to .89 (Average Cronbach's alpha = .77).

Interest towards routine studying. Interest towards routine studying was evaluated using an improved version of the instrument designed in the context of Study 2. Please refer to the "Measures" subsection of the "Method" section of Study 2, for a description of the original version of this instrument. Four new items were added to the four existing items: (a) How boring is routine studying in this course? (b) How monotonous is routine studying in this course? (c) How stimulating is routine studying in this course? (d) How tedious is routine studying in this course? Items (a), (b), and (c) are reverse coded. The 8 interest items displayed an internal consistency value of .85. For the purposes of the present study, the items were summed two by two to yield four indicators of interest towards routine studying.

Academic motivation. As in Study 1 and 2, academic motivation was measured using the adapted version of the Academic Motivation Scale (AMS; Vallerand et al, 1992, 1993). Please refer to the "Measures" subsection of the "Method" section of Study 1, for a complete description of the psychometric properties of this instrument. Here again, four global self-determination indices were generated by summing the scores on the subscales of the AMS using the following equation: $((2\text{INTEG}) + (\text{IDEN}) - (\text{ER}) - (2\text{AMO}))$.

Analyses

The data analyses in Study 3 were accomplished in four steps: (a) preliminary analyses, (b) descriptive analyses, (c) interest-enhancing strategy use in the experimental and control groups, and (d) structural equation modeling procedures. The latter step was itself comprised of two stages: Testing the measurement model and testing the hypothesized model. Again, structural equation modeling procedures were performed using the program LISREL VIII (Jöreskog et Sorbom, 1996a, 1996b). For a description of the options preferred in the selection of the estimation procedure, the analyzed matrix type, and the assessment of model fit, please refer to the "Analyses" subsection of the "Method" section of Study 1. The paragraphs below describe some of the problems pertaining to the assessment of change, and introduce the modeling technique which was selected for the analysis of the longitudinal data gathered in the study.

The assessment of change. As mentioned at the beginning of the chapter, common methods for assessing change are fraught with problems. Observed difference scores are unbiased estimates of true change. Yet, difference scores have been criticized for their lack of reliability (Burr & Nesselroade, 1990). Also, difference scores are often negatively related to baseline levels (Jamieson, 1995). The regression approach (i.e., the residualized change scores method) has often been proposed as an advantageous alternative to the observed

difference approach (e.g., Cronbach & Furby, 1970; Lord, 1963). This method attempts to ensure that baseline and change measures are uncorrelated. However, because observed posttest scores are regressed upon observed baseline scores, the reliability of residualized change scores is also questionable (Linn & Slinde, 1977). Cross-lag panel designs presuppose synchronicity and stationarity assumptions that are rarely met. Moreover, when correlations between observed variables are utilized, the results can also suffer from a lack of reliability. Thus, measurement error is a possible source of bias when using the three aforementioned techniques to assess change.

Tucker, Damarin, and Messick (1966) devised a method in which the unreliability of the measures is accounted for and controlled: The base-free measurement of change. Specifically, these authors derived a procedure to assess true change from the classical test theory framework (e.g., Lord, 1963). The base-free measurement of change method proposes to divide true change into two orthogonal components: a true dependent change score (i.e., a true predicted gain), and a true independent change score (i.e., a true residualized gain). The former reflects the pattern of true interindividual change common to the group under study, and the latter represents the true intraindividual change, that is, the individual deviations from the common trend of true change. This method has two particularly appealing features. First, the recourse to true scores is an elegant remedy to the biases induced by potential reliability problems. Second, the distinction between interindividual and intraindividual trends in true change is liable to be very useful in the investigation of a variety of research questions. However, the base-free measurement of change harbors a serious drawback. The model obtained using the equations provided by Tucker and his colleagues (1966) is under-identified, unless the reliabilities of the measures under study are assessed to estimate the error variances of each construct of the model (Raykov, 1992a). The use of reliability estimates renders the model just-identified. While the parameters of a just-identified model can be evaluated, the

overall adjustment of such a model cannot be tested. Also, the reliance on reliability values estimated from the sample limits the generalizability of the results (Raykov, 1993). In the present study, the data were analyzed using an improved multi-indicator version of the base-free measurement of change method.

Base-free measurement of change structural equation modeling procedure. This method was designed by Raykov (1992a, 1992b, 1993), on the basis of the single indicator procedure proposed by Tucker and his colleagues (1966), and on the basis of the exploratory factor analytical approach to the study of change devised by Tisak & Meredith (1990a, 1990b). In contrast with the single-indicator method (Tucker et al., 1966), the latent variable method requires several congeneric indicators for each construct. The resulting model is over-identified, and its adjustment to the sample covariance can be estimated. Moreover, the unique error associated with each indicator is estimated and extracted from the latent variables.

The analyzed covariance matrix can be parameterised to assess either total true change (i.e., the interindividual trend in change), or residualized true change (i.e., the intraindividual change). These two options for structuring growth yield equivalent models. Thus, researchers are free to use the modeling alternative that best suits their needs from a substantive point of view. In the present study, because the focus was on intraindividual processes, the residualized change model was favored. In line with the method proposed by Tucker and his colleagues, in this modeling technique, true pretest is partialled out from true posttest, which allows for the estimation of a residualized "true" gain score, called the base-free measure of change. The base-free measure of change is assumed to be independent from true pretest. It represents the "true individual differences from the group-specific linear trend of true change" (Raykov, 1992a). This method permits a consistent and efficient assessment of the covariation between the true gain scores and the variables representing predictors of change. For more

details on this particular structural modeling technique, please refer to Raykov (1992a, 1992b, 1993).

Results

Preliminary Analyses

Absence of outliers. The standardized scores for all the variables included in the model were examined to identify univariate outliers. No cases displayed standardized scores greater than |3|. The potential presence of multivariate outliers was assessed using multivariate standardized residuals, leverage, and Mahalanobis' and Cook's distances. Multivariate standardized residuals revealed acceptable values, ranging from -2.37 to 2.29. There were no Cook's distances in excess of 1.00 (Hamilton, 1992). However, 10 cases (3%) displayed significant Mahalanobis' distances ($\chi^2_{(df=36)} > 73.40, p < .001$), as well as leverage values above .20 (Huber, 1981). These participants were excluded from subsequent analyses, yielding a final sample size of 344.

Sample size. The present sample size ($N=344$) is largely superior to the minimum of 200 participants required for structural equation modeling (Ullman, 1996). Thus, it is deemed satisfactory for the purposes of the present study.

Normality. The summary statistics of all the variables of the longitudinal interest and motivation self-regulation model were scanned. Table 12 presents the means, standard deviations, kurtosis, and skewness values, of these variables. The means and standard deviation values revealed that the variables under study displayed acceptable dispersion. Kurtosis values ranged from -1.26 to .35, while skewness values ranged from -.67 to .40. Despite a few high values, univariate values of kurtosis and skewness were generally deemed adequate because mean kurtosis ($|M|=.58$) and mean skewness ($|M|=.36$) were below 1.00

Summary Statistics for the Indicators of the Longitudinal Interest and Motivation Self-Regulation Model (Study 3)

Variable	Mean	Standard Deviation	Kurtosis	Skewness
Challenge Enhancement (CH)	21.21	7.94	-.68	-.33
CH1	4.14	2.42	-1.22	.18
CH2	5.87	2.48	-.72	-.64
CH3	6.04	2.26	-.50	-.62
CH4	5.16	2.39	-1.01	-.18
Provision of Rationales (RAT)	20.99	6.91	-.46	-.26
RAT1	4.43	2.32	-1.03	.05
RAT2	5.18	2.25	-.85	-.35
RAT3	5.41	2.22	-.75	-.27
RAT4	5.98	2.10	-.34	-.58
Attentional Involvement (ATT)	24.19	6.53	-.25	-.41
ATT1	6.28	1.80	.10	-.65
ATT2	5.90	1.88	-.38	-.44
ATT3	6.28	1.78	-.10	-.54
ATT4	5.76	2.06	-.70	-.37
Stimulation from the Environment (STIM)	17.27	6.93	-.38	.20
STIM1	4.18	2.43	-.98	.39
STIM2	3.99	2.68	-1.18	.40
STIM3	4.84	2.63	-1.26	-.02
STIM4	4.30	2.80	-1.26	.28
Introduction of Variety (VAR)	21.01	6.50	-.42	-.24
VAR1	4.83	2.41	-1.15	-.19
VAR2	5.97	2.25	-.59	-.57
VAR3	5.14	2.18	-.81	-.26
VAR4	5.04	2.22	-.91	-.25
Interest at Time 1 (INT)	43.74	10.77	-.31	-.23
INT1	10.43	2.92	-.27	-.23
INT2	10.22	3.20	-.35	-.20
INT3	11.88	3.21	-.20	-.51
INT4	11.11	3.67	-.70	-.10
Interest at Time 2 (INTB)	44.16	10.22	.35	-.33
INTB1	10.62	2.83	-.02	-.37
INTB2	10.07	3.31	-.18	-.28
INTB3	12.69	2.83	.14	-.55
INTB4	10.71	3.38	-.19	-.15

Variable	Mean	Standard Deviation	Kurtosis	Skewness
Self-Determination at Time 1 (SD)	29.62	30.05	-.41	-.49
SD1	7.92	9.99	-.34	-.57
SD2	7.76	9.02	.15	-.67
SD3	5.54	7.84	-.74	-.01
SD4	7.94	6.98	-.29	-.32
Self-Determination at Time 2 (SDB)	26.33	29.25	-.52	-.35
SDB1	7.46	9.38	-.37	-.47
SDB2	7.15	8.46	.22	-.67
SDB3	5.17	7.54	-.40	-.13
SDB4	6.60	7.22	-.52	-.21

Note. The theoretical range is 1 to 9 for all interest-enhancing strategies items, 2 to 18 for all interest indicators, and -24 to +24 for self-determination indices. For the global scores, the theoretical range is 4 to 36 for interest-enhancing strategies, 8 to 72 for interest scores, and -96 to +96 for self-determination.

(Muthén & Kaplan, 1985). Overall, examination of summary statistics provided no reason to suspect that the distribution of the variables under study departed significantly from normality. Also, from a multivariate point of view, the distribution of standardized residuals appeared approximately normal.

Linearity. Potential departures from linearity were evaluated by examining a random selection of bivariate scatterplots. Overall, the bivariate distributions revealed linear configurations. Moreover, as previously mentioned, the distribution of the standardized multivariate residuals appeared approximately normal.

Homoscedasticity. The bivariate scatterplots were also inspected to identify uneven distributions of the variance between the pairs of variables. The scattergrams displayed no evidence of heteroscedasticity.

Absence of multicollinearity. The correlations between all possible pairs of variables included in the analyses were scanned for multicollinearity. No correlations in excess of .90 were detected.

Descriptive Statistics

Interest-enhancing strategies. The interest-enhancing strategies that were most frequently used by the students were attentional involvement ($M=24.19$, $SD=6.53$) and challenge enhancement ($M=21.21$, $SD=7.94$), followed by introduction of variety ($M=21.01$, $SD=6.50$), provision of self-relevant rationales ($M=20.99$, $SD=6.91$), and exploitation of stimulation from the physical context ($M=17.27$, $SD=6.93$). Considering that the theoretical range of global strategy use scores was 4 to 36, the students employed the five interest-enhancing strategies to a moderate extent when coping with an uninteresting academic task: Routine studying.

Interest towards routine studying. The mean interest level for routine studying was 43.74 at Time 1, and 44.16 at Time 2. The theoretical range for global interest scores was 8 to 72. Hence, participants did not find that routine studying was a very interesting academic task.

Self-determination. The sum of the four self-determination indices ranged from -64.00 to 93.00 at Time 1 and from -59.00 to 85.00 at Time 2. The average self-determination level was 29.62 ($SD=30.05$) at Time 1 and 26.33 ($SD=29.25$) at Time 2. The theoretical range for the global self-determination scores was -96 to +96. Thus, the mean level of self-determination in the sample was positive, but of small magnitude, and the self-determination scores were normally distributed on either side of the mean at Time 1 (kurtosis=-.41; skewness=-.49), and at Time 2 (kurtosis=-.52; skewness=-.35).

Sex differences. As shown in Table 13, a comparison of the means using Bonferroni t-tests indicated that men ($n=90$) and women ($n=248$) did not differ in their use of interest-enhancing strategies, nor in their mean levels of interest and self-determination.

Interest-Enhancing Strategy Use in the Experimental and Control Groups

The mean levels of interest-enhancing strategy use in the experimental group and in the control group were compared using Bonferroni t-tests. As shown in Table 14, no significant differences in strategy use were identified. This finding supported the notion that the administration of the IESS to the experimental group at Time 1 had no lingering impact on interest-enhancing strategy use at Time 2.

Structural Equation Modeling

Testing the measurement model. A first CFA was performed for the Interest Enhancing Strategies Scale (IESS), at Time 1. The items comprising each subscale of the

Table 13

Comparison of the Means of Interest Enhancing-Strategies, Interest, and Self-Determination for Men and Women (Study 3)

Subscale	Mean (SD)		t-Value (df=336)	Probability
	Men (n=90)	Women (n=248)		
Challenge Enhancement	20.15 (8.43)	21.68 (7.71)	-1.59	.112
Provision of Self-Relevant Rationales	20.42 (6.67)	21.20 (6.99)	-.91	.362
Attentional Involvement	22.72 (7.00)	24.75 (6.29)	-2.55	.017
Stimulation from the Environment	16.90 (6.85)	17.44 (6.97)	-.63	.526
Introduction of Variety	19.59 (6.72)	21.51 (6.34)	-2.44	.015
Interest at Time 1	42.47 (10.30)	44.19 (10.94)	-1.29	.198
Interest at Time 2	42.71 (10.63)	44.65 (10.06)	-1.54	.125
Self-Determination at Time 1	23.03 (32.11)	32.04 (28.95)	-2.43	.016
Self-Determination at Time 2	20.89 (30.91)	28.43 (28.46)	-2.12	.035

Note. As the Levene's test for equality of variance revealed no significant differences for the pairs of means compared above, t-tests for groups with equal variances were performed. The Bonferroni correction was employed to control for the number of comparisons ($p=.05/9$ t-tests = .005). No significant differences were identified since there was no probability values in excess of .005.

Table 14

Comparison of the Means of Interest-Enhancing Strategies for the Participants of the Experimental and Control Groups (Study 3)

Subscale	Mean (SD)		t-Value (df=516)	Probability
	Experimental Group (n=344)	Control Group (n=174)		
Challenge Enhancement	21.39 (7.26)	20.60 (6.87)	1.18	.238
Provision of Self-Relevant Rationales	20.57 (7.09)	20.52 (7.49)	.08	.937
Attentional Involvement	23.50 (6.58)	23.41 (6.52)	.16	.876
Stimulation from the Environment	18.43 (7.37)	18.67 (8.17)	-.33	.744
Introduction of Variety	21.07 (6.62)	20.50 (6.92)	.96	.340

Note. As the Levene's test for equality of variance revealed no significant differences for the pairs of means compared above, t-tests for groups with equal variances were performed. The Bonferroni correction was employed to control for the number of comparisons ($p=.05/5$ t-tests = .01). No significant differences were identified since there was no probability values in excess of .01.

IESS served as the observed indicators of the underlying latent factors. First, it was hypothesized that the responses on the IESS were explained by five factors, corresponding to the five subscales of the IESS. That is, the items of the IESS were hypothesized to display significant and substantial loadings on their target factors, and zero loadings on all other factors. Second, the factors were hypothesized to be correlated. Third, the error variance associated with each item was hypothesized to be small, yet significant, and its uniqueness component to be uncorrelated with that of any other item. Finally, for identification purposes, the loadings between the first indicator of each latent construct and its target factor were fixed to 1.0. The results mostly supported the hypotheses. The model displayed an acceptable fit ($\chi^2_{(160, N=344)}=357.84$, $p<.001$; RMSEA=.06; GFI=.90; CFI=.93; PCFI=.78). Moreover, the estimated parameters were mostly significant and within an acceptable range. However, one modification index was of sizable magnitude ($\theta\delta_{(10,9)}=40.58$). This indicated the presence of a correlation between the error uniqueness values of two items in the attentional involvement subscale. Consequently, a second model was tested wherein this correlation was estimated. This resulted in a significant improvement of the overall fit of the model ($\Delta\chi^2_{(\Delta df=1, N=344)}=36.06$, $p<.001$; $\chi^2_{(159, N=344)}=321.78$, $p<.001$; RMSEA=.05; GFI=.91; CFI=.94; PCFI=.79). Also, three factor correlations were non-significant (in both the initial and second models). Specifically, exploitation of stimulation was uncorrelated with challenge enhancement, self-relevant rationales, and attentional involvement. A final model was tested wherein the three non-significant correlations were fixed to 0. There was no significant difference between the fit of the final model and the second model ($\Delta\chi^2_{(\Delta df=3, N=344)}=2.74$, ns). The fit of the final model remained satisfactory ($\chi^2_{(162, N=344)}=324.52$, $p<.001$; RMSEA=.05; GFI=.91; CFI=.94; PCFI=.80).

A second CFA was performed on the indicators designed to assess interest towards routine studying. In order to detect potential correlations between the error uniqueness values

of the indicators at Time 1 and Time 2, which is a common occurrence in longitudinal models, the four indicators measuring interest at Time 1 and the four indicators measuring interest at Time 2 were included within the same model. First, it was hypothesized that the responses on the interest indicators were explained by two factors: Interest at Time 1 and interest at Time 2. Thus, the indicators were hypothesized to display significant and substantial loadings on their target factor, and zero loadings on the other factor. Second, both factors were hypothesized to be correlated. Third, the error variance associated with each indicator was hypothesized to be small, yet significant, and its uniqueness component to be uncorrelated with that of any other indicator. Finally, for identification purposes, the loadings between the first indicator of each latent construct and its target factor were fixed to 1.0. The results did not support the hypotheses. In spite of the fact that the estimated parameters were significant and within an acceptable range, the initial model displayed an unsatisfactory fit ($\chi^2_{(19, N=344)}=277.93$, $p<.001$; RMSEA=.20; GFI=.80; CFI=.84; PCFI=.57). A very large modification index suggested that the fit could be significantly improved by estimating the correlation between the error uniqueness values of two indicators of interest at Time 1 ($\theta\delta_{(3,1)}=135.03$). Thus, a second model was assessed wherein this correlated error term was estimated. Although the fit of the second model was substantially better ($\Delta\chi^2_{(\Delta df=1, N=344)}=121.26$, $p<.001$; $\chi^2_{(18, N=344)}=156.67$, $p<.001$; RMSEA=.15; GFI=.89; CFI=.91; PCFI=.59), another sizable modification index indicated that it would be possible to further improve the adjustment of the model. Specifically, this modification index pertained to correlated error uniqueness values between two interest indicators at Time 2 ($\theta\delta_{(8,6)}=63.82$). Consequently, a final model was evaluated wherein this correlated error was estimated. Except for the RMSEA, the fit of the final model was satisfactory ($\Delta\chi^2_{(\Delta df=1, N=344)}=23.17$, $p<.001$; $\chi^2_{(17, N=344)}=98.09$, $p<.001$; RMSEA=.12; GFI=.94; CFI=.95; PCFI=.58). As previously mentioned, RMSEA values should be inferior to .08 for the model to be deemed satisfactory (Browne & Cudeck, 1993).

Yet, in the context of the present analysis, because other fit indices were mostly satisfactory, it is likely that the unacceptable RMSEA value reflects questionable parsimony, rather than misfit within the model specification. The RMSEA includes a penalty for lack of parsimony, inasmuch as it represents the estimated discrepancy between the model and the population covariance, *per degree of freedom* (Browne & Cudeck, 1993). Thus, as indicated by the RMSEA, the model was not parsimonious. Yet, as mentioned in Studies 1 and 2, this was not considered a problem because the goal of the procedure was to identify areas of misfit within the measurement of interest.

A third and final CFA was performed on the indices designed to assess self-determination. Again, in order to detect potential correlations between the error uniqueness values of the indicators at Time 1 and Time 2, which is a common occurrence in longitudinal models, the four indicators measuring self-determination at Time 1 and the four indicators measuring self-determination at Time 2 were included within the same model. First, it was hypothesized that the responses on the self-determination indicators were explained by two factors: Self-determination at Time 1 and self-determination at Time 2. Thus, the indicators were hypothesized to display significant and substantial loadings on their target factor, and zero loadings on the other factor. Second, both factors were hypothesized to be correlated. Third, the error variance associated with each indicator was hypothesized to be small, yet significant, and its uniqueness component to be uncorrelated with that of any other indicator. Finally, for identification purposes, the loadings between the first indicator of each latent construct and its target factor were fixed to 1.0. The results supported the hypotheses. The model displayed a satisfactory fit ($\chi^2_{(19, N=434)}=119.24$, $p<.001$; RMSEA=.12; GFI=.92; CFI=.96; PCFI=.65). Moreover, the estimated parameters were significant and within an acceptable range. However, one modification index was of sizable magnitude ($\theta\delta_{(7,3)}=43.78$). This indicated the presence of a correlation between the error uniqueness values of a self-determination

indicator at Time 1, and the same indicator at Time 2. Consequently, a second and final model was tested wherein this correlated error component was estimated. This resulted in a significant improvement of the overall fit of the model ($\Delta\chi^2_{(\Delta df=1, N=344)}=46.08, p<.001$; $\chi^2_{(18, N=344)}=73.16, p<.001$; RMSEA=.09; GFI=.95; CFI=.98; PCFI=.63). As underscored in the above paragraph, RMSEA values should fall below the .08 threshold to be considered acceptable (Browne & Cudeck, 1993). Here again, it is likely that the high RMSEA value resulted from parsimony deficits, rather than model misfit. Yet, as mentioned in Studies 1 and 2, lack of parsimony was not considered a problem because the goal of the procedure was to identify areas of misfit within the measurement of self-determination.

Testing the hypothesized model. As previously specified, the hypothesized model is depicted in Figure 8 (see p. 90). The base-free measurement of change model is designed to be implemented using a confirmatory factor analysis approach (Raykov, 1992a). Thus, an all-X model was specified. The measurement portion of the model was specified in accordance with the results reported in the section above. Also, in accordance with the method recommended by Raykov (1992a), the impact of the true pretest was partialled out of the posttest by estimating additional loadings. Specifically, for the interest construct, the loadings between the factor representing interest at Time 1, and the indicators of interest at Time 2, were estimated. Alternatively, for the self-determination construct, the loadings between the factor representing self-determination at Time 1, and the indicators of self-determination at Time 2, were estimated. Having extracted the true influence of Time 1 from the indicators of Time 2, the latent constructs associated with Time 2 represent the true gains in interest and motivation. The statistical hypotheses corresponding to the structural portion of the model are described below. First, the correlations between challenge enhancement, provision of self-relevant rationales, stimulation from the environment, and attentional involvement, were hypothesized to be substantial, and significant. The correlations between challenge enhancement, provision

of self-relevant rationales, and attentional involvement, were hypothesized to be positive, while the correlation between stimulation from the environment and attentional involvement was hypothesized to be negative. The correlation between introduction of variety and attentional involvement was hypothesized to be non-significant. Second, the correlation between attentional involvement and gains in interest was hypothesized to be substantial, positive, and significant. Third, the correlation between gains in interest and gains in self-determination was hypothesized to be substantial, positive, and significant. Fourth, on the basis of the results of Study 1 and Study 2, the correlation between baseline levels of interest and self-determination was hypothesized to be substantial, positive, and significant. Finally, because it is assumed in the base-free measurement of change method that the latent gain scores are independent of initial status, the covariance between interest at Time 1 and gains in interest, as well as the covariance between self-determination at Time 1 and self-determination, were fixed to 0.

The covariance matrix obtained from the observed data is presented in Appendix F. Except for the GFI, results revealed that the fit of the model was generally acceptable ($\chi^2_{(567, N=344)}=1094.04$, $p<.001$; RMSEA=.05; GFI=.85; CFI=.92; PCFI=.83). Moreover, the parameters were generally significant, and within an acceptable range. Yet, it is important to note that the correlation between exploitation of stimulation and attentional involvement was not significant. On the basis of the results of Study 1 and Study 2, the correlation between introduction of variety and attentional involvement had been fixed to 0, and results supported this decision since the modification index associated with this correlation was of small magnitude. Because introduction of variety and exploitation of stimulation did not contribute in any way to the model, a new model was estimated in which those two constructs were omitted. An illustration of the final model is presented in Figure 9. Except for the GFI, model estimation yielded a satisfactory fit ($\chi^2_{(330, N=344)}=711.48$, $p<.001$; RMSEA=.06; GFI=.87; CFI=.94; PCFI=.82). The RMSEA and the CFI were within an acceptable range. The GFI

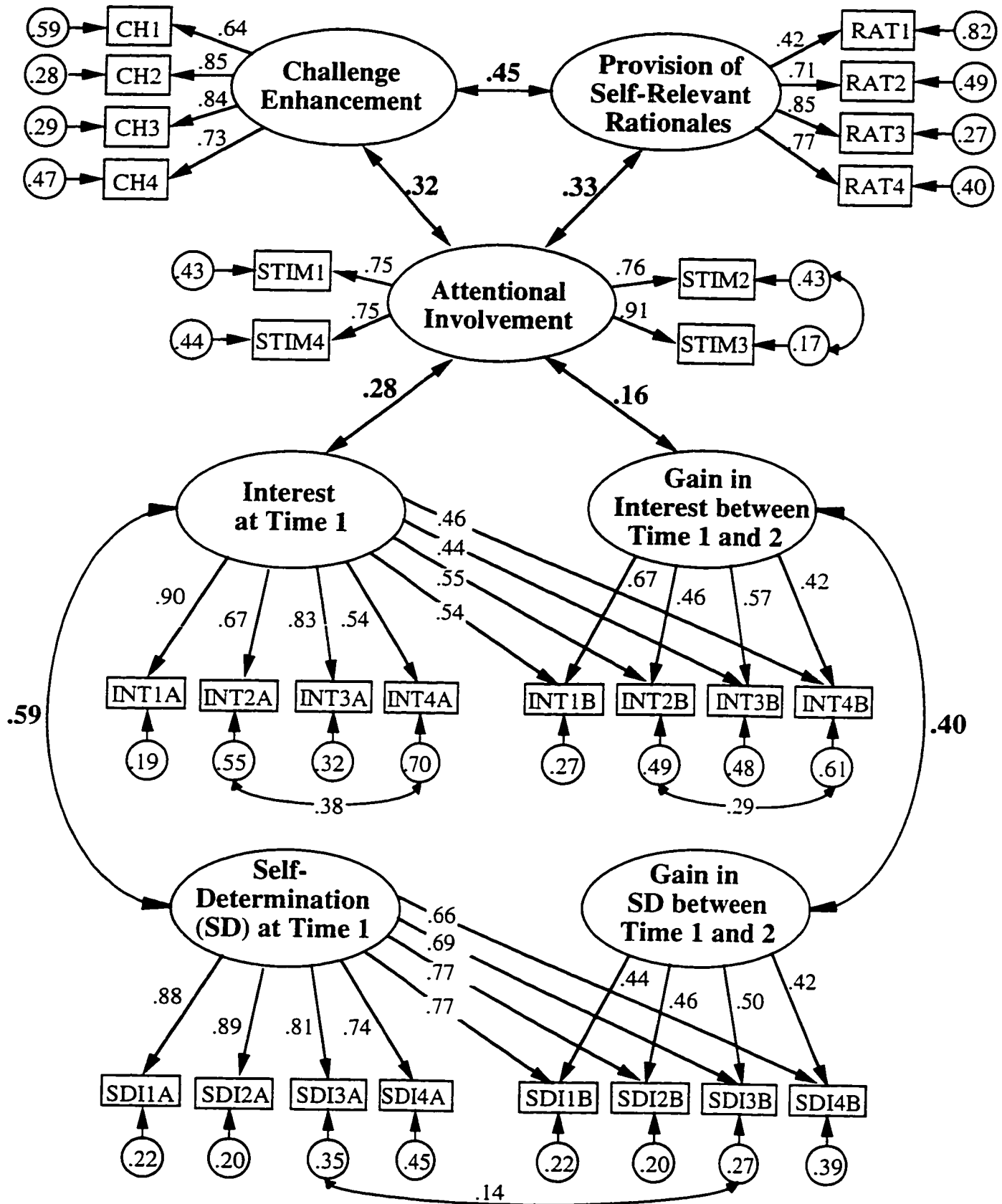


Figure 9. Longitudinal Interest and Motivation Self-Regulation Model (Study 3; $N=354$). All the parameters in the model are standardized and significant at the .05 level.

indicated that the model explained 87% of the sample covariance. This value is below the .90 threshold that generally indicates a minimally acceptable fit. However, because the GFI is not independent from sample size (Anderson & Gerbin, 1984; Joreskog & Sorbom, 1996a; Marsh et al., 1988), values below .90 can be expected when the sample size is not very large, particularly if the model is complex (Bollen, 1989), and if the latent constructs are correlated (Hu & Bentler, 1995). Finally, the PCFI revealed that the model presented a satisfactory degree of parsimony.

With the exception of the correlation between exploitation of stimulation and attentional involvement, the hypothesized correlations are supported by the results. Specifically, challenge enhancement and provision of self-relevant rationales were significantly associated with attentional involvement, the magnitude of these regression coefficients was moderate, and their valence was positive. Thus, a more frequent use of challenge enhancement and provision of self-relevant rationales correlated with a more frequent use of attentional involvement. Attentional involvement, in turn, predicted gains in interest significantly. The magnitude of the correlation was modest and its valence positive. Thus, a more frequent use of attentional involvement was associated with gains in interest over the 10 week period. Next, gains in interest levels were significantly associated with gains in self-determination. This correlation was moderate and positive. Finally, the correlation between baseline levels of interest and self-determination was significant, moderate, and positive.

Chapter Summary and Discussion

The objective of Study 3 was to test the interest and motivation self-regulation model using a longitudinal design. Earlier results supported the notion that the use of four interest-enhancing strategies, namely challenge enhancement, provision of self-relevant rationales, exploitation of stimulation, and attentional involvement, was associated, directly or indirectly, with concurrent levels of interest. Interest, in turn, displayed a significant association with concomitant levels of self-determination. Thus, in Study 1 and Study 2, covariation has been detected amongst the variables in the model, which is a necessary but insufficient condition for causality. The goal of Study 3 was to investigate yet another necessary condition for causality: The temporal precedence of the hypothesized "cause" on the "effect". In other words, the goal of the study was to assess whether interest-enhancing strategy use could predict future levels of interest and motivation. To this end, interest-enhancing strategies, interest, and self-determination were measured twice, at a 10 weeks interval.

In agreement with the results of Study 1 and Study 2, it was first hypothesized that students utilize challenge enhancement, provision of self-relevant rationales, exploitation of stimulation, introduction of variety, and attentional involvement, when they have to perform an uninteresting academic task. Here again, the results of the descriptive statistics revealed that the participants used all five interest-enhancing strategies to a moderate extent when performing an uninteresting academic task.

Second, in line with the results of Study 1 and 2, it was hypothesized that the use of challenge enhancement and provision of self-relevant rationales was associated positively with attentional involvement. Alternatively, it was hypothesized that the use of exploitation of stimulation was negatively associated with attentional involvement. Introduction of variety was hypothesized to be unrelated to attentional involvement. Next, attentional involvement was

hypothesized to predict gains in interest over time positively. Gains in interest, in turn, were hypothesized to be positively associated with gains in self-determination.

The data were analyzed using the base-free measurement of change structural modeling approach (Raykov, 1992a, 1992b, 1993). The results mostly supported the hypothesized model. With the exception of the correlation between exploitation of stimulation and attentional involvement, all hypothesized structural coefficients were significant. Frequent use of challenge enhancement and frequent use of self-relevant rationales were associated with greater attentional involvement. As hypothesized, introduction of variety was uncorrelated with attentional involvement. Next, attentional involvement predicted long term gains in interest levels. Gains in interest, in turn, were associated with gains in self-determination. Thus, with the exception of the absence of the negative association between exploitation of stimulation and attentional involvement, the results of Study 3 were congruent with the results of Study 1 and 2.

Study 3 contained several methodological improvements with respect to Study 1 and 2. The longitudinal nature of the design provided a better test of the direction of causal relationships. Also, the interest measure utilized in Study 3 was improved ($\alpha=.85$) by comparison to the measure used in Study 2 ($\alpha=.68$). Moreover, the comparison between the frequency of interest-enhancing strategy use by the "experimental" group and the "control" group indicated that it was unlikely that completing the questionnaire at Time 1 had an impact on the responses at Time 2.

Yet, Study 3 is not exempt of methodological limitations. It is necessary to acknowledge that the results were not obtained using a strictly confirmatory modeling procedure. Specifically, four respecifications were necessary to adjust the measurement model, and the global model was tested twice in order to eliminate the non-significant constructs. Thus, it is impossible to assess with certainty whether the non-significant

correlation between exploitation of stimulation and attentional involvement is specific to the sample under study, or whether it actually indicates that this strategy has no long term impact on interest and self-determination. Additional research is needed to investigate this question and to further validate the present findings. Also, Study 3, being of correlational design, is liable to the same internal validity threats than Study 1 and Study 2. The potential impact of confounding factors cannot be reliably ruled out.

In summary, challenge enhancement and provision of self-relevant rationales were indirectly and positively correlated to long term gains in interest and self-determination, through the mediating impact of attentional involvement. Attentional involvement was directly and positively related to long term gains in interest. Finally, long term gains in interest were associated with long term gains in self-determination. Exploitation of stimulation and introduction of variety were not associated with attentional involvement, and were thus deleted from the model. Albeit Study 3 provided a more stringent test of the interest and motivation self-regulation model, additional research wherein the internal validity threats are better controlled is in order to further explore the validity of the interest and motivation self-regulation model.

CHAPTER FIVE

STUDY 4

An Experimental Test of the Interest and Motivation Self-Regulation Model

The results of Study 3 revealed that three interest-enhancing strategies, namely challenge enhancement, provision of self-relevant rationales, and attentional involvement were directly or indirectly related to longitudinal gains in interest and motivation. By comparison with Study 1 and Study 2, the longitudinal nature of the design in Study 3 provided stronger support for the hypothesized causal impact of interest-enhancing strategy use on subsequent levels of interest and motivation. However, because interest-enhancing strategy use was measured after the fact rather than manipulated, and because participants were not randomly assigned to experimental conditions, the possibility remains that some unwelcome influence may have tainted the results. The goal of Study 4 was to address this eventuality by providing an experimental test of the interest and motivation self-regulation model.

Students recruited in the context of various undergraduate university courses were invited to participate in a laboratory experiment designed to assess the impact of interest-enhancing strategy use on interest and motivation. The study comprised six experimental groups corresponding to five interest-enhancing strategy conditions (i.e., challenge enhancement, attentional involvement, self-relevant rationales, introduction of variety, and exploitation of stimulation), and to one control condition. Interest-enhancing strategy use was manipulated while participants performed a monotonous free recall computer task. Interest and motivation levels were measured on several occasions throughout the experiment.

On the basis of Studies 1, 2, and 3, it was hypothesized that involving one's attention on the task was the only strategy directly related to gains in interest and motivation. However, because correlational designs were used in Studies 1, 2, and 3, and because the present study

was a first attempt at manipulating interest-enhancing strategy use, the eventuality of an effect of the four remaining interest-enhancing strategies on interest and motivation could not be reliably ruled out. Thus, the potential impact of all five interest-enhancing strategies on interest and motivation was assessed in the present study.

Method

Participants

The sample comprised 120 English-speaking women recruited in a variety of undergraduate courses offered by the Faculty of Social Sciences. Participants' age ranged from 17 to 47 years ($M=22.18$; $SD=5.14$). Most participants studied full-time, while a small minority (6%) studied on a part-time basis. Participants' grade point average ranged from 3.0 to 9.6, on a 10 point scale ($M=7.10$; $SD=1.53$). These statistics indicate that academic success varied broadly in the sample under study. Moreover, self-reported grade point average scores formed an approximately normal distribution (kurtosis=.47; skewness=-.71). The participants were randomly assigned to one of six experimental conditions: (1) Challenge enhancement, (2) Attentional involvement, (3) Self-relevant rationale, (4) Introduction of variety, (5) Exploitation of stimulation, and (6) Control condition. Twenty participants were assigned to each condition.

Stimulus Materials

The experimental task was chosen on the basis of its monotonous characteristics. Specifically, participants performed a lengthy and tedious free recall task. Seventeen lists of nonsense syllables were created using "consonant-vowel-consonant" trigrams (i.e., three letter syllables). Each list was composed of 14 trigrams, and the lists were matched for the average meaningfulness of the trigrams according to the norms of Archer (1960). The stimuli ranged from 32% to 48% meaningfulness value on the Archer norms (1960), and the meaningfulness values of the trigrams composing the lists averaged 40% for each list. Moreover, the distributions of the meaningfulness values of the trigrams composing each list were approximately equivalent. The trigrams composing each list, along with their meaningfulness

scores, are presented in Appendix G. The presentation of the lists, and of the trigrams within each list, were randomized individually for each research participant, in order to control for potential list effects. The stimuli were presented in the center of a 8" X 10" computer screen. All letters were typed in courier 10 capitals. The letters were presented in white against a black background.

Procedure

The experiment was conducted in a single session. Participants were tested individually in a quiet distraction-free room. It took approximately one hour and a half for each participant to complete the experiment. The procedure was double-blind. Participants were told (falsely) that the goal of the study was to investigate the factors influencing memory. Thus, participants were naive to the specific goals of the research project, and to the experimental condition to which they were assigned. The two female experimenters were naive to the experimental condition to which the participants were assigned. The gender of the experimenters was matched to the participants' gender, to avoid any gender effects.

Participants performed several free recall lists. The experimenter initiated the presentation of each list. The randomized presentation of the lists and syllables was controlled by the computer, using Micro Experiment Laboratory (MEL), version 2.0 (Schneider, Rodgers, Machiejczyk, Zuccolotto, & St. James, 1995). The syllables were presented at a rate of one every 2 seconds. The end of each list was announced by a sound signal, and by the appearance of the word "RECALL" on the computer screen. Participants had exactly 2 minutes to try to recall as many syllables as possible. Participants wrote the syllables they remembered down on a sheet of paper provided by the experimenter, in the order of their choice. A new sheet of paper was handed out for every trial. The computer announced the end of the recall period by a sound signal. The presentation of the stimuli and the recall procedure were the

same throughout the experiment. The details pertaining to the consecutive steps of the experimental procedure are outlined in the paragraphs below.

Firstly, general instructions were presented on the computer screen. (see Appendix H). These instructions detailed the recall procedure explained in the paragraph above. They also contained a note asking that the participant answer the questionnaires presented during the experiment as accurately and honestly as possible. The experimenter and the participant read the instructions together and the experimenter answered any questions that the participant might have.

Secondly, the participant performed three practice lists to familiarize herself with the experimental task. A first list was presented as a mere example and the participant was instructed to simply watch. The participant then attempted to memorize a second list, and to record the syllables on a sheet of paper during the recall period. The participant attempted to memorize and recall the third list in the same fashion. A short questionnaire assessing baseline levels of interest and motivation was then completed by the participant (see Appendix I).

Thirdly, the experimenter gave a second set of instructions to the participant on a sheet of paper (see Appendix J). The experimenter read those instructions aloud to the participant. This was done to highlight the importance of those instructions. First, instructions designed to alleviate performance anxiety were given to participants in all experimental conditions. Pilot testing revealed that because participants worried excessively about their performance on the retention task, their performance anxiety nullified any attempts on the experimenter's behalf to manipulate interest and motivation. Thus, participants were instructed not to worry about their performance and to simply try to do their best. Second, the participants were given the instructions which constitute the experimental induction. The six statements that were used to effect the experimental manipulation are presented in Table 15. Five of these instruction sets were designed to prompt the participants to use one of the five interest-enhancing strategies.

Table 15

Statements Designed to Effect the Experimental Induction in Each Condition (Study 4)

Experimental Condition	Instructions
Challenge Enhancement	Challenge yourself to try as hard as you can for all the remaining lists of syllables. Please challenge yourself mentally to do your best at the beginning of each new list.
Attentional Involvement	Do your best to concentrate on the retention task and to devote all of your attention to the syllables presented on the screen. If you realize that your mind is wandering, gently bring back your attention to the memory task. Please try to focus as much as you possibly can on the syllables each time you start a new list.
Self-Relevant Rationale	The memory task will help you to discover different memory strategies and to exercise your retention abilities. Thus, it will help you to gain efficient retention skills and it will stimulate your memory. Please actively remind yourself of these beneficial consequences each time you finish recalling the items of a list.
Introduction of Variety	Vary the approach you use to memorize the syllables each time you work on a new list. Do not be afraid to experiment with new strategies or with new combinations of strategies. Once you have identified a few favorite strategies, please rotate through them from one list to another.
Exploitation of Stimulation	Entertain pleasant thoughts (i.e., pleasant mental images or memories) while you perform the memory task. Please try to conjure up agreeable thoughts as often as you possibly can until the end of the experiment.
Control	In order to help you to perform the task, please keep your eyes on the screen.

The sixth set of instructions corresponded to a neutral statement designed to have no impact on interest and motivation. This was the control condition to which the experimental conditions were to be compared.

In the fourth step, the experimental lists *per se*, the participants memorized and recalled 14 lists of syllables. A short questionnaire, identical to the questionnaire utilized during the practice trial to assess baseline levels of interest and motivation, was completed after every second list (see Appendix I). Thus, 7 measures of interest and motivation were obtained at regular intervals during the course of the experiment. In each experimental condition, a reminder to use the interest-enhancing strategy was presented after lists 6, 10, and 14 (see Appendix K). At the same time points, the control group was presented with a neutral statement.

In the fifth step, participants completed a short questionnaire containing manipulation checks pertaining to the experimental conditions. The sixth step was intended as a behavioral check of the level of interest and motivation toward the task. Specifically, participants were told that they still had a few things to do to complete the experiment, but that the experimenter responsible for that part of the testing was busy finishing up with another participant. The participants were asked to wait a few minutes. The experimenter told each participant that, while she waited, she could perform extra free recall lists, or read magazines. Five magazines, covering a variety of topics, were spread out on a coffee table in a corner of the room. The participants were left alone for exactly five minutes. The computer was set to record any additional lists performed by the participants. Traditionally, this type of "free-choice" behavioral measure has been used to assess intrinsic motivation towards an experimental task (e.g., Deci, 1971, 1972). In the present study, because the task was not supposed to be intrinsically motivating, it was expected that the majority of the participants would read magazines.

Finally, the participants filled out a short questionnaire pertaining to the experimental manipulations. They also filled out a final questionnaire assessing their perception of the experimenter, their level of anxiety during the experimental task, their current feelings, their propensity towards socially desirable responding, their current interest and motivation towards the experimental task, and demographic questions (see Appendix L and M). A short verbal interview was also conducted to assess the efficacy of the experimental manipulation and the credibility of the cover stories. Participants were then debriefed, thanked, and excused.

Self-Report Measures

Self-report levels of interest, task difficulty, and motivation during the experiment. This short questionnaire is presented in Appendix I. Because of time constraints, the format of these measures had to be as concise as possible. Interest was assessed using a single straightforward item: "At the present moment, to what extent do you feel that the retention task is interesting?" Difficulty was also assessed using a unique item: "At the present moment, to what extent do you feel that the retention task is difficult?" Participants responded to the interest and difficulty item on Likert scales ranging from 1 ("Not at all") to 9 ("Extremely"). Motivation was measured using an adapted version of the Situational Motivation Inventory (SIMS; Guay, 1997; Guay & Vallerand, 1995). In contrast with other motivation inventories, which generally target motivation at the domain level (e.g., sports, education, leisure, etc.), this scale assesses temporary motivational states. In this respect, it was the ideal instrument for the present study, wherein motivation levels were to be evaluated repeatedly over a short period of time. The SIMS is designed to assess five of the motivational constructs proposed by Deci and Ryan (1985): Intrinsic motivation, extrinsic motivation by external, introjected, and identified regulation, and amotivation. Integrated regulation, being of no relevance in a situational context, is not included in the SIMS. The

SIMS comprises 4 items per subscale. In the studies performed by Guay (Guay, 1997; Guay & Vallerand, 1995), the SIMS factorial structure has been supported by both exploratory and confirmatory factor analyses. Its subscales have demonstrated satisfactory convergent validity and internal consistency. Moreover, correlations between the subscales generally presented a simplex pattern, which lends support to the construct validity of the self-determination continuum. The items are presented as possible answers to a general question: "Why are you presently doing this activity?" Participants rate the items on a Likert scale ranging from 1 ("Does not correspond at all") to 7 ("Corresponds exactly").

In the present study, the items were slightly modified to fit the context of the free recall task. Also, because of space constraints, only 2 items were retained for each subscale. In addition, although the anchor points were left unchanged, the original 7 point scale was replaced by a 9 point scale. This was done to increase the precision of the scale, so that minor changes might be more easily detected. Examples of items for each subscale of the modified version of the SIMS are reported in Table 16. Global self-determination indices (SDI) were generated by weighting each item according to its position on the self-determination continuum, and by summing the weighted scores (e.g., $SDI1 = (2IDEN) + (INTRO) - (ER) - (2AMO)$). As mentioned in Study 1, past research provided extensive support for the validity and reliability of self-determination indices (e.g., Ryan & Connell, 1989). In the present study, the average internal consistency of the self-determination indices was .81. As in Studies 1, 2, and 3, the intrinsic motivation subscale was not utilized. For the purposes of the analyses of the present study, the self-determination indices were averaged to obtain a single overall self-determination score.

Experimental induction check. This very short self-report questionnaire is presented in Appendix L. Two straightforward questions were designed to assess whether the participants understood the instructions pertaining to the experimental induction, and whether

Table 16

Examples of Items for the Adapted Version of the Situational Motivational Scale
(Study 4)

Subscale	Why are you presently doing this activity?
Intrinsic Motivation	Because it's really fun
Extrinsic Motivation by Identified Regulation	Because it's a sensible way to gain meaningful experience
Extrinsic Motivation by Introjected Regulation	Because I would feel bad if I didn't
Extrinsic Motivation by External Regulation	Because that's what I'm supposed to do
Amotivation	I don't know. I have the impression I'm waisting my time

they followed these instructions. The items were rated on a Likert scale ranging from 1 ("Not at all") to 9 ("Very much").

Postexperimental questionnaire. The postexperimental questionnaire is presented in appendix M. This questionnaire comprised several items. Firstly, interest towards the experimental task was assessed again using the same question than during the experiment itself. Secondly, participants rated a series of adjectives describing their present feelings (i.e., happy, optimistic, anxious, etc.) on a scale ranging from 1 ("Not at all") to 9 ("Extremely"). Thirdly, on a scale ranging from 1 ("Not at all") to 9 ("Very much"), participants rated the extent to which they felt worried about their performance during the experiment, and the extent to which they felt comfortable or pressured by the experimenter. Fourthly, participants completed the 20 items composing the "Impression Management" (IM) subscale of the Balanced Inventory of Desirable Responding (Paulhus, 1984, 1988). The items of the IM subscale correspond to minor wrongs that most people commit every once in a while (e.g., I don't gossip about other people's business). Half of the items are worded negatively, and half are worded positively. The negative items are reversed scored. Extreme systematic underreporting of undesirable behaviors and/or overreporting of positive ones is deemed suspicious. For each item, the participants are given a score of 1 for extreme responses (6 or 7), and a score of 0 for any other answers. Thus, global IM scores can range from 0 to 20. The IM subscale has demonstrated satisfactory convergent and discriminant validity, as well as acceptable internal consistency and temporal stability (Paulhus, 1984, 1988). Finally, participants answered a variety of demographic questions, and a question designed as a behavioral measure of postexperimental motivation towards the free recall task. Specifically, participants were asked to indicate for how many additional testing sessions, consisting of the same experimental task, they would be willing to volunteer for. The possible number of sessions ranged from 0 to 10.

Scoring of Free Recall Performance

Participants were given 1 point for each correct trigram. No credit was given for misspelled trigrams. Global scores for each lists were obtained by summing the points for the successfully remembered items. The sixteen performance scores were combined two by two, in order of presentation, to obtain 8 retention scores.

Analyses

Analyses were accomplished in several steps: (a) preliminary analyses, (b) analysis of the impact of interest-enhancing strategies on interest and motivation, (c) analysis of the post-experimental levels of interest and motivation, (d) interrelations between interest and motivation, (e) analysis of postexperimental feelings, and (f) analysis of the impact of interest-enhancing strategies on free recall performance. In the preliminary analyses, series of manipulation checks were performed to assess the validity of the experimental procedure. The impact of interest-enhancing strategies on interest and self-determination was analyzed using a priori comparisons wherein the interest and self-determination levels at the end of the experiment, in each experimental group, was compared to the control group. These analyses were complemented by an exploratory MANCOVA which utilized the totality of the interest and self-determination measures that were taken during the experiment. The analysis of postexperimental levels of interest and motivation compared the change in interest and self-determination between measures taken at the beginning of the experiment, and after the five minutes free-choice period. Interrelations between change in interest and change in self-determination during the experiment were assessed by regressing observed self-determination difference scores upon observed interest difference scores. The experimental conditions were also compared on a variety of postexperimental feelings using series of exploratory ANOVAs.

Finally, the evolution of performance on the free recall task during the experiment, in each condition, was compared to the control group using a mixed ANCOVA.

Results

Preliminary Analyses

Interest-enhancing strategies manipulation check. During the post-experimental interview, the participants were asked to verbalize the written instructions they had received during the experiment. The 3 participants that were unable to remember these instructions (which had been repeated to them in writing and verbally *4 times* during the course of the experiment), were not included in the sample. During the interview, the participants were also asked whether they had followed the instructions pertaining to the experimental induction. Two participants admitted ignoring the instructions and were deleted from the sample. Additional participants were tested to replace the five participants that were excluded from the sample. Questionnaire measures revealed that the vast majority of participants reported following the instructions pertaining to the experimental induction of interest-enhancing strategy use during most of the session. On a scale ranging from 1 to 9, the mean self-reported interest-enhancing strategy use was 6.97 ($SD=1.78$). Self-report measures also indicated that participants had clearly understood the instructions related to their assigned interest-enhancing strategy. On scale ranging from 1 to 9, participants rated the instructions as quite clear ($M=8.16$, $SD=1.60$). Finally, there were no significant differences, at any point in time during the experiment, in the perceived level of difficulty of the experimental task, between the six experimental conditions. Thus, the induction did not appear to raise the level of difficulty of the experimental task in the conditions.

Behavioral check of interest and motivation levels. The vast majority of participants read magazines during the free-choice period (89%). Thirteen participants initiated the presentation of extra free recall lists. However, when verbally questioned about the extra lists during the postexperimental interview, 9 out of these 13 participants said they just initiated the lists for the fun of playing with the computer without attending to the syllables, let alone try to recall them. Of the remaining 5, 2 watched the extra lists in an attempt to discern patterns between the syllables, but making no effort to recall them. Thus, only 3 participants truly performed additional free recall lists. When asked, 2 of them said they were frustrated with their performance, and wanted to see if they could do better while initiating the presentation of the lists themselves. A single participant reported doing additional lists out of interest towards the task. Overall, the results of the free-choice period strongly indicated that the experimental task was not intrinsically interesting, nor motivating.

Experimenters. Participants reported feeling fairly comfortable with the experimenters on a 9 point self-report scale ($M=7.83$, $SD=1.40$). Also, on a 9 point scale, participants felt very little pressure as a result of the presence of the experimenter in the room while they were performing the free recall task ($M=1.5$, $SD=1.16$). Finally, there were no differences in interest nor motivation scores, at any point in time, between the participants tested by the two experimenters.

Credibility of cover stories. During the postexperimental interview, all participants were asked if they believed the cover story pertaining to the goal of the experiment. Although a few participants admitted being suspicious, nobody guessed what the true purpose of the study was. Participants were also asked whether they believed the cover story related to the free-choice period. Three participants saw through the cover story, but did not perform additional lists. They told the experimenter that, even if they had a strong hunch that this was what they were expected to do, they could not quite bring themselves to do more lists.

Performance anxiety. In order to assess whether the instruction designed to alleviate performance anxiety was successful, the participants were asked how worried they were about their performance on a 9 point scale, in the postexperimental questionnaire. Results revealed a moderate mean level of performance anxiety ($M=4.57$, $SD=2.09$). However, no significant correlations were found between anxiety and interest, nor between anxiety and motivation, at any point in time during the experiment. Hopefully, this is an indication that performance anxiety did not affect the results of the study to a significant extent.

Social desirability. Because it was not possible to rule out the possibility that interest and motivation measures would be affected by social desirability, socially desirable responding was assessed using the "Impression Management" subscale of the Balanced Inventory of Desirable Responding (Paulhus, 1988). No extreme cases were identified. On a range from 0 to 20, the scores ranged from 1 to 15, and the global mean level of impression management in the sample was 6.39 ($SD=3.62$). This value is comparable to the scores found by Paulhus in college students samples ($M=11.9$, $SD=4.5$, Paulhus, 1984; $M=4.9$, $SD=3.2$, Paulhus, 1988). Finally, there were no significant correlations between impression management and interest, nor between impression management and motivation, at any point in time during the experiment.

Baseline levels of interest and motivation. Because the participants were randomly assigned to the different treatment groups, there is no reason for the initial levels of interest and motivation to differ across groups. However, as an additional precaution, baseline measures of interest and motivation were compared across groups to ensure that the groups presented no a priori biases. Results revealed no significant differences in the baseline levels of interest ($F_{(5,114)}=1.03$, $p=.40$), nor in the baseline levels of motivation ($F_{(5,114)}=1.52$, $p=.19$).

Impact of Interest-Enhancing Strategies on Interest and Motivation

Planned comparisons. As previously mentioned, the main question of interest in the context of the present study is whether the experimental manipulation of interest-enhancing strategy use induced reliable effects on interest and motivation. This hypothesis was tested using a priori contrasts to evaluate potential differences on the last interest and motivation measures obtained during the experiment. The control group was compared to each of the five experimental groups using Dunnett's test (Dunnett, 1955). In support of the findings of Studies 1, 2, and 3, participants in the attentional involvement condition displayed significantly higher interest levels ($M=5.1$), than participants in the control condition ($M=3.1$; $D_{(6,114)} > 2.89$, $p < .01$). Also, the motivation levels of the participants in the attentional involvement condition ($M=11.05$) was significantly superior to the motivation levels of the control group ($M=-1.05$; $D_{(6,114)} > 2.26$, $p < .05$). In contrast with the results of Studies 1, 2, and 3, a significant difference arose between the interest scores of the participants in the exploitation of stimulation condition and the control group ($D_{(6,114)} > 2.26$, $p < .05$). The participants in the exploitation of stimulation condition reported higher levels of interest ($M=4.9$) than the participants in the control group ($M=3.1$). Likewise, the mean motivation levels of the participants in the exploitation of stimulation condition ($M=10.2$) were significantly higher than those of the control group ($M=-1.05$; $D_{(6,114)} > 2.26$, $p < .05$). Another unexpected significant difference appeared between the motivation levels of the self-relevant rationale condition and the control group ($D_{(6,114)} > 2.26$, $p < .05$). The mean motivation scores in the self-relevant rationale condition ($M=9.5$) were greater than the mean motivation scores in the control condition ($M=-1.05$). No significant differences were found between the interest levels of the control group ($M=3.10$), and the challenge enhancement ($M=3.65$), introduction of variety ($M=2.65$), and self-relevant rationale ($M=4.05$) conditions. Also, no significant

differences materialized between the motivation levels of the control group ($M=-1.05$), and the challenge enhancement ($M=8.05$) and introduction of variety ($M=-2.30$) conditions.

Multivariate analysis of covariance. In order to take full advantage of the extensive set of interest and motivation measures collected in the present study, a multivariate analysis of covariance was conducted as an exploratory supplement to the a priori comparisons. A 6 X 7 mixed multivariate analysis of covariance was performed on two dependent variables: Interest and motivation. The dependent variables were adjusted using the baseline scores of interest and motivation as covariates. Baseline interest levels were given the highest priority. The first independent variable, namely the experimental condition, was a between-participants measure comprising 6 levels: challenge enhancement, attentional involvement, self-relevant rationale, introduction of variety, exploitation of stimulation, and control condition. The more powerful "univariate" approach to repeated measures was preferred to the "multivariate" approach⁶. Thus, time, as a within-participant factor, constituted the second independent variable. This variable consisted of seven levels, corresponding to the seven occasions on which interest and motivation measures were obtained. The observed baseline means of interest and motivation, as well as the observed means of interest and motivation for each of the experimental conditions, and each of the measurement time points, are presented in Table 17. The evolution over time of interest levels for each experimental condition, after adjusting for baseline levels of interest and motivation, is depicted graphically in Figure 10. The evolution over time of motivation levels for each experimental condition, after adjusting for baseline levels of interest and motivation is represented graphically in Figure 11.

⁶ The MANCOVA itself is, of course, a multivariate procedure. The terms "univariate" and "multivariate" refer to how the repeated measures were analyzed statistically. In the "univariate" approach, the repeated measures are treated as multiple levels of a single within-subject independent variable. In the "multivariate" approach, the repeated measures are treated as multiple dependent variables.

Observed Means of Interest and Motivation for Experimental Condition and Time
(Study 4)

<u>Time</u>	<u>Experimental Condition</u>					
	CH	ATT	RAT	VAR	STIM	C.G.
<i>Baseline</i>						
Interest	5.35 (1.60)	6.15 (1.66)	5.90 (1.68)	5.10 (2.02)	5.65 (1.63)	5.65 (1.23)
Motivation	13.90 (7.32)	14.00 (8.83)	11.65 (12.48)	7.70 (11.31)	14.35 (8.02)	9.25 (11.53)
<i>Time 1</i>						
Interest	5.30 (1.38)	5.90 (1.48)	5.65 (1.46)	4.95 (1.85)	5.90 (1.85)	5.35 (1.81)
Motivation	12.20 (7.02)	14.40 (9.45)	14.05 (10.46)	7.40 (11.18)	14.70 (9.84)	6.40 (11.99)
<i>Time 2</i>						
Interest	4.70 (1.92)	6.10 (1.59)	5.30 (1.75)	4.25 (1.65)	5.65 (2.01)	4.65 (1.90)
Motivation	11.15 (8.60)	14.35 (10.00)	15.10 (9.58)	5.80 (11.73)	13.35 (11.52)	6.05 (11.31)
<i>Time 3</i>						
Interest	4.35 (1.66)	5.80 (1.96)	5.00 (1.84)	3.65 (1.76)	5.35 (2.32)	3.90 (2.05)
Motivation	10.10 (8.57)	14.80 (10.10)	15.50 (9.13)	4.75 (11.13)	13.05 (11.12)	3.10 (12.18)
<i>Time 4</i>						
Interest	4.05 (1.85)	5.80 (2.04)	4.80 (1.80)	3.55 (2.01)	5.40 (2.30)	3.70 (2.39)
Motivation	8.90 (8.60)	13.90 (10.40)	13.40 (12.51)	2.20 (13.95)	12.90 (10.54)	2.30 (14.28)

<u>Time</u>	<u>Experimental Condition</u>					
	CH	ATT	RAT	VAR	STIM	C.G.
<i>Time 5</i>						
Interest	4.00 (1.65)	5.10 (2.43)	4.75 (1.92)	3.05 (1.70)	5.20 (2.35)	3.45 (2.26)
Motivation	9.55 (8.07)	13.50 (9.46)	12.95 (11.45)	.20 (13.53)	11.70 (9.55)	-.25 (18.08)
<i>Time 6</i>						
Interest	3.85 (1.81)	5.15 (2.52)	4.45 (2.09)	3.00 (1.89)	5.20 (2.46)	3.35 (2.41)
Motivation	8.70 (8.26)	11.90 (10.43)	10.75 (13.35)	-2.15 (15.48)	11.35 (11.38)	-.80 (17.81)
<i>Time 7</i>						
Interest	3.65 (1.79)	5.10 (2.51)	4.05 (2.01)	2.65 (1.69)	4.90 (2.47)	3.10 (2.20)
Motivation	8.05 (9.09)	11.05 (12.31)	9.50 (14.49)	-2.30 (15.27)	10.20 (11.65)	-1.05 (17.86)

Note. The standard deviations are presented below the means, in parentheses. CH=Challenge Enhancement; ATT=Attentional Involvement; RAT=Self-Relevant Rationale; VAR=Introduction of Variety; STIM=Exploitation of Stimulation; C.G.=Control Group. The theoretical range is 1 to 9 for interest scores and -24 to +24 for motivation scores.

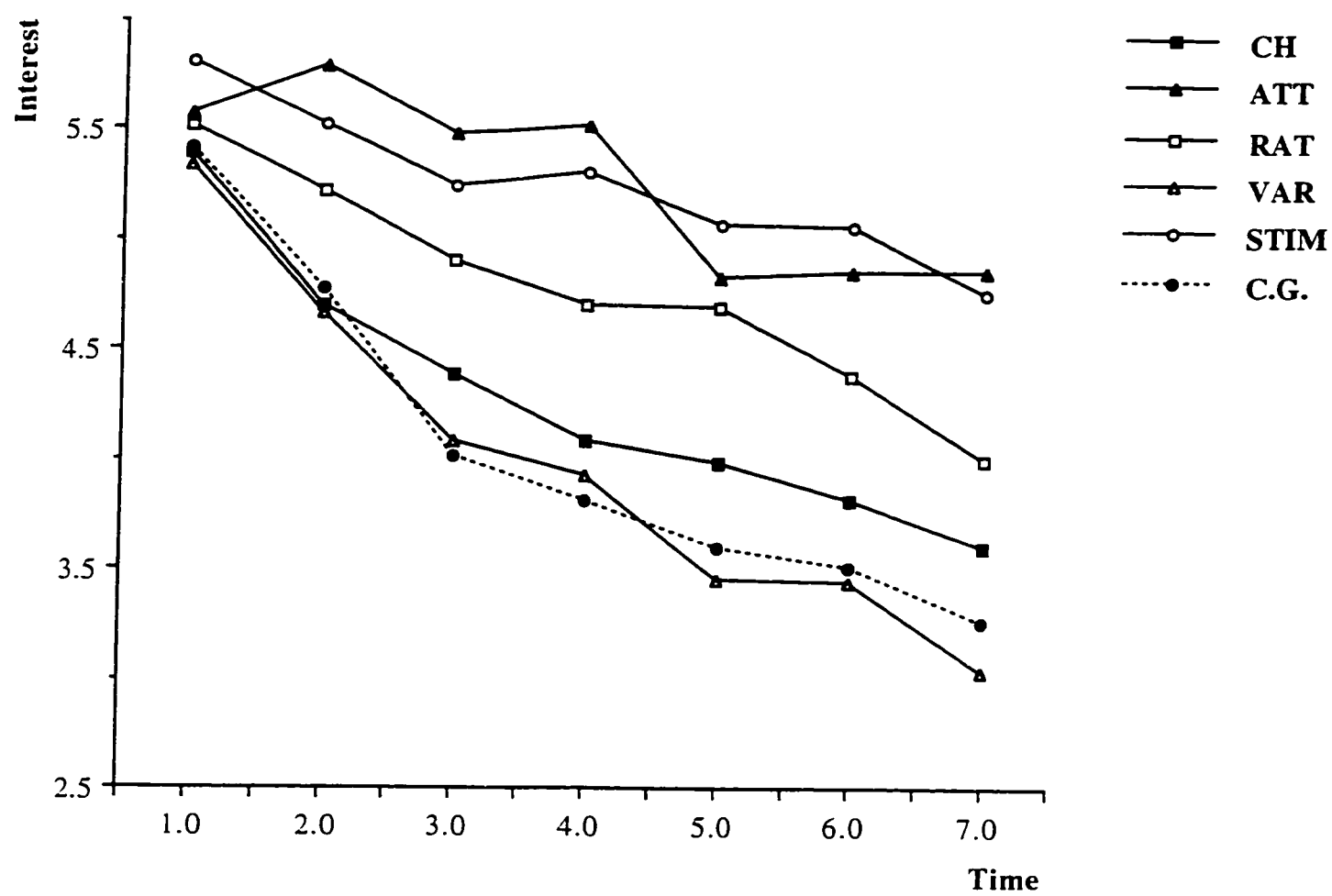


Figure 10. *Adjusted Interest Means for Condition and Time (Study 4)*

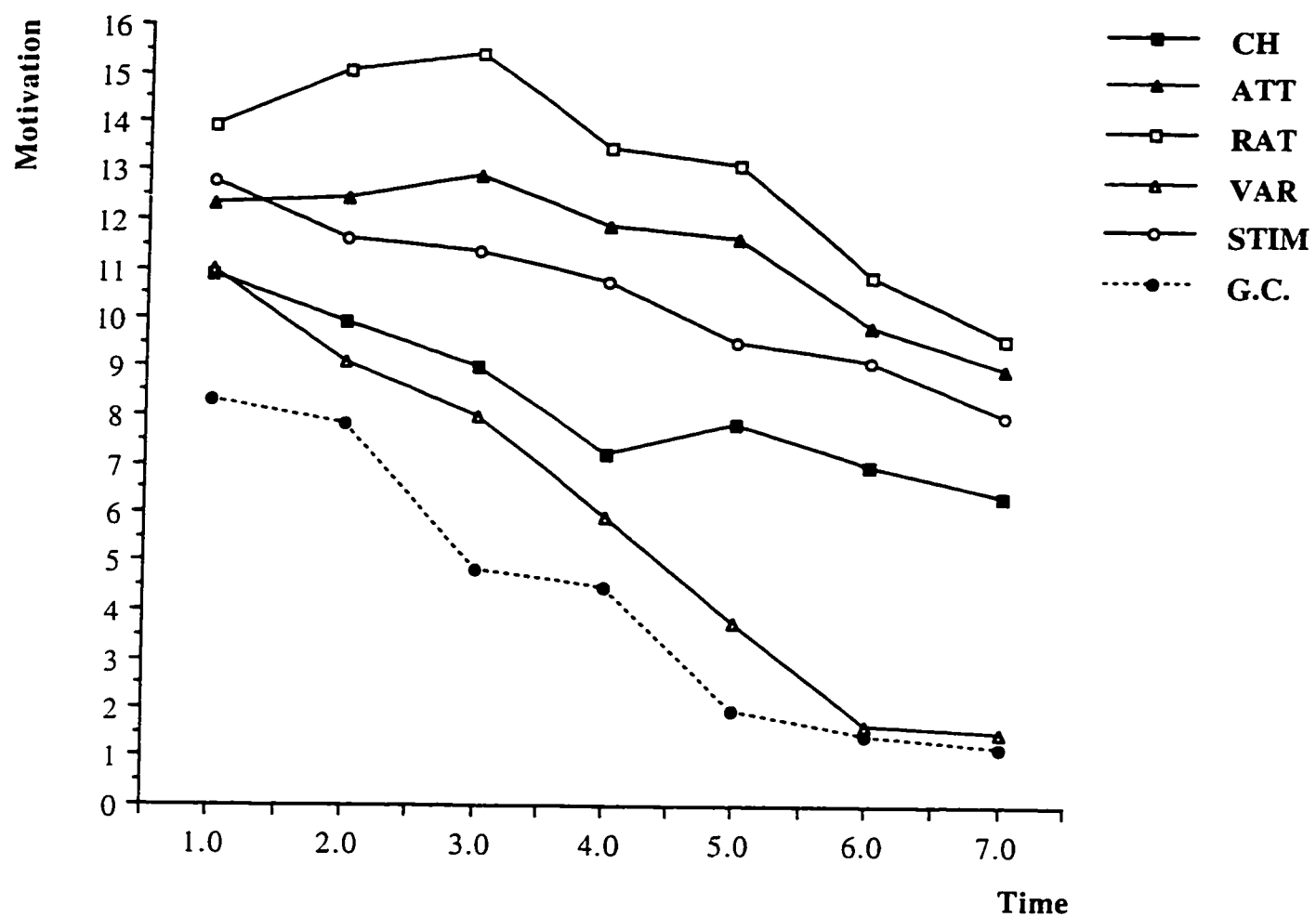


Figure 11. Adjusted Motivation Means for Condition and Time (Study 4)

Preliminary analyses were first performed to evaluate if the data under study satisfied the statistical assumptions underlying the use of multivariate analysis of covariance (MANCOVA). For each covariate, as well as each dependent variable, within-cells standardized distributions were inspected and Mahalanobis' distances were computed ($\alpha=.001$). No univariate or multivariate within-cells outliers were detected. MANCOVA is robust to departures from multivariate normality when the number of participants within the cells is uniform and equal to a minimum of 20, when two-tailed tests are performed, and when there are no outliers (Stevens, 1992; Tabachnick & Fidell, 1996). These requirements were met in the present study. The sample comprised 20 cases within each cell of the design. There were also many more cases than dependent variables within each cell. Moreover, the univariate within-cells distributions of the covariates and dependent variables, as well as the multivariate distribution of the within-cells residuals, were approximately normal. Even though MANCOVA is generally robust to violations of the homogeneity of variance-covariance matrices assumption (Tabachnick & Fidell, 1996), sample within-cells variances were compared across groups for each dependent variable. The ratio of largest to smallest variance was inferior to 10:1 for both dependent variables (Tabachnick & Fidell, 1996). This ratio was 4.41:1 for interest, and 5.02:1 for motivation. A random selection of bivariate within-cells scatterplots between covariates and dependent variables, and between dependent variables, were examined to identify potential departures from linearity. The bivariate distributions yielded fairly linear scattergrams. Moreover, as mentioned previously, the distribution of the standardized multivariate residuals within the cells appeared approximately normal. The determinant of the pooled within-cells correlation matrix was .51. This value is superior to .0001, thus indicating that multicollinearity is not a problem in the present analysis (Tabachnick & Fidell, 1996). The assumption of homogeneity of regression is deemed tenable since there is no reason to suspect the presence of an interaction between the independent variables and the

covariates. To summarize, the results of the preliminary analyses indicated no obvious departures from the many assumptions presupposed by multivariate analysis of covariance. The results of the MANCOVA are reported below.

As indicated by Wilk's lambda, the combined covariates predicted the combined dependent variables significantly (approximate $F_{(4,222)}=38.25$, $p<.001$). In addition, experimental condition (approximate $F_{(10,222)}=2.79$, $p<.01$) and time⁷ (approximate $F_{(7,751)}=27.16$, $p<.001$) both displayed significant main effects on the combined interest and motivation scores. The interaction of experimental condition and time did not produce a significant impact on the combined dependent variables (approximate $F_{(33,751)}=1.31$, $p=.20$). A moderate association was found between dependent variables and covariates (partial $\eta^2=.40$). Results also revealed a modest degree of association between the dependent variables and the main effects of experimental condition (partial $\eta^2=.11$) and time (partial $\eta^2=.19$).

Multiple regressions were performed to further investigate the extent of the adjustment provided by baseline levels of interest and motivation, to subsequent levels of interest and motivation. A first regression was run for interest levels, using baseline levels of interest and motivation as multiple predictors. Results revealed that baseline measures of interest and motivation both provided significant adjustment to interest levels. The standardized regression coefficient of interest on baseline levels of interest was .32 ($t=3.67$, $p<.001$), while the

⁷ Effects involving repeated measures, namely time and the interaction of experimental condition and time, were adjusted to compensate for potential departures from the sphericity assumption. Deviations from this assumption are assessed by a parameter named epsilon (Greenhouse & Geisser, 1959). When sphericity holds, epsilon is equal to 1. To ensure protection against inflated type 1 error, the degrees of freedom of the multivariate F tests were weighted using epsilon (Collier, Baker, Mandeville, & Hayes, 1967). Because the Greenhouse-Geisser method yields an overly conservative estimator of epsilon, while the Huynh-Feldt method produces a somewhat lenient epsilon value, the average of the Greenhouse-Geisser (GG) and Huynh-Feldt (HF) estimators was utilized to correct the degrees of freedom of the multivariate F-tests for time, and for experimental condition by time (Stevens, 1992; $\epsilon_{GG}=.53$, $\epsilon_{HF}=.57$, $M_{\epsilon}=.55$).

standardized regression coefficient of interest on baseline levels of motivation was .26 ($t=2.94$, $p<.01$). There was a modest association between interest and baseline levels of interest ($\eta^2=.11$), and motivation ($\eta^2=.07$). A second regression was run for motivation levels, using baseline levels of interest and motivation as multiple predictors. Results revealed that baseline measures of motivation provided a significant adjustment to motivation levels. The standardized regression coefficient of motivation on baseline levels of motivation was .70 ($t=10.90$, $p<.001$). There was a moderate degree of association between baseline levels of motivation and motivation ($\eta^2=.51$). Baseline measures of interest were not useful in adjusting motivation levels ($\beta=.07$, $t=1.15$, $p=.25$, $\eta^2=.01$).

Significant multivariate main effects were followed up with univariate and Roy-Bargmann stepdown F-tests to assess the effects of independent variables on single dependent variables, after adjusting for covariates. In these analyses, interest was given highest priority because, in the present study, it is hypothesized to be an antecedent of motivation. The averaged pooled within-cell correlation between interest and motivation was .39, indicating that stepdown analyses were appropriate. Results are shown in Table 18. Alpha was divided according to the values reported in the last column of Table 18 to maintain an experimentwise error rate of 5% for each effect. First, experimental condition made a unique contribution to the prediction of both interest and motivation. After correcting for covariates, experimental condition significantly predicted interest (stepdown $F_{(5,112)}=2.57$, $p<.05$), as well as motivation after interest was accounted for (stepdown $F_{(5,111)}=3.04$, $p<.05$). There was a modest degree of association between experimental condition and interest ($\eta^2=.10$), and between experimental condition and motivation ($\eta^2=.17$). Second, time also made a unique contribution to the prediction of both interest and motivation. After correcting for covariates, time significantly predicted interest (stepdown $F_{(6,684)}=51.39$, $p<.001$), and motivation once interest was accounted for (stepdown $F_{(6,683)}=6.53$, $p<.001$). There was a moderate degree of

Table 18

Tests of Covariates, Experimental Condition, and Time (Study 4)

Effect	Dependent Variables	Univariate F	df	Stepdown F	df	α
Covariates	Interest	21.10 ^a	2/112	21.10***	2/112	.03
	Motivation	340.40 ^a	2/112	59.53***	2/111	.02
Experimental Condition	Interest	2.57 ^b	5/112	2.57*	5/112	.03
	Motivation	4.50 ^b	5/112	3.04*	5/111	.02
Time	Interest	51.39 ^a	6/684	51.39***	6/684	.03
	Motivation	26.68 ^a	6/684	6.53***	6/683	.02

^a Significance level would be $p < .001$ in a univariate context.

^b Significance level would be $p < .05$ in a univariate context.

* $p < .05$

*** $p < .001$

association between experimental condition and interest ($\eta^2=.31$), and a modest degree of association between experimental condition and motivation ($\eta^2=.19$).

The unique impact of experimental condition on interest and motivation was further investigated using single degree of freedom contrasts, in which the experimental groups were compared to the control group. For each of the dependent variables, alpha was fixed to .01, using a Bonferroni correction, to maintain a hypothesiswise error rate of 5%.

In accordance with the results of the a priori comparisons, the single degree of freedom contrasts revealed a significant difference between the adjusted mean levels of interest in the control group, and in the attentional involvement ($F_{(1,113)}=7.09, p<.01$) and exploitation of stimulation conditions ($F_{(1,113)}=7.85, p<.01$). The participants in the attentional involvement (adjusted marginal $M=5.26$) and exploitation of stimulation (adjusted marginal $M=5.24$) conditions displayed significantly higher interest levels than participants in the control condition (adjusted marginal $M=4.04$). No significant differences were identified between the interest levels of the control group and the challenge enhancement (adjusted marginal $M=4.27$), self-relevant rationale (adjusted marginal $M=3.57$), and introduction of variety (adjusted marginal $M=3.98$) conditions.

Also in agreement with the results of the a priori comparisons, the single degree of freedom contrasts revealed a significant difference between the adjusted mean levels of motivation in the control group, and in the attentional involvement ($F_{(1,113)}=10.34, p<.01$), exploitation of stimulation ($F_{(1,113)}=7.04, p<.01$), and self-relevant rationale conditions ($F_{(1,113)}=15.68, p<.001$). The participants in the attentional involvement (adjusted marginal $M=11.39$), exploitation of stimulation (adjusted marginal $M=10.42$), and self-relevant rationale (adjusted marginal $M=13.02$) conditions reported significantly higher motivation levels than the participants in the control condition (adjusted marginal $M=4.29$). There were no significant differences between the motivation levels of the control group, and the challenge enhancement

(adjusted marginal $M=8.23$) and introduction of variety (adjusted marginal $M=5.83$) conditions. To summarize, after adjusting for baseline levels of interest and motivation, and when the effects of experimental condition were pooled over the duration of the entire experiment, attentional involvement and exploitation of stimulation induced higher levels of interest and motivation than the control group, while self-relevant rationale induced higher levels of motivation than the control group.

Finally, the unique impact of time on interest and motivation was further studied using trend analysis. The variation in the data was partitioned using orthogonal polynomials. For each of the dependent variables, alpha was fixed to .01, using a Bonferroni correction, to maintain a hypothesiswise error rate of 5%. As can be seen in Figure 12, the linear trend was by far the most prominent for interest levels ($F_{(1,114)}=101.65, p<.001$), although a quadratic curve would also fit the data adequately ($F_{(1,114)}=7.66, p<.01$). Motivation levels were best described by a linear trend as well ($F_{(1,114)}=47.36, p<.001$). In sum, after adjusting for the baseline levels of interest and motivation, and when the effects of time are pooled over all experimental conditions, interest and motivation levels declined in a linear fashion as a function of time. This decline was more pronounced for motivation than for interest.

Postexperimental Levels of Interest and Motivation

In contrast with the section above, which pertained to measures taken *during* the experiment, the present subsection is concerned with the interest and motivation levels that were obtained *after* the experiment. As can be recalled from the "Procedure" subsection of the "Method" section, postexperimental measures were obtained after the five minutes free-choice period.

First, changes between the initial interest levels and the postexperimental interest levels were assessed by performing a oneway analysis of variance (ANOVA) on the observed

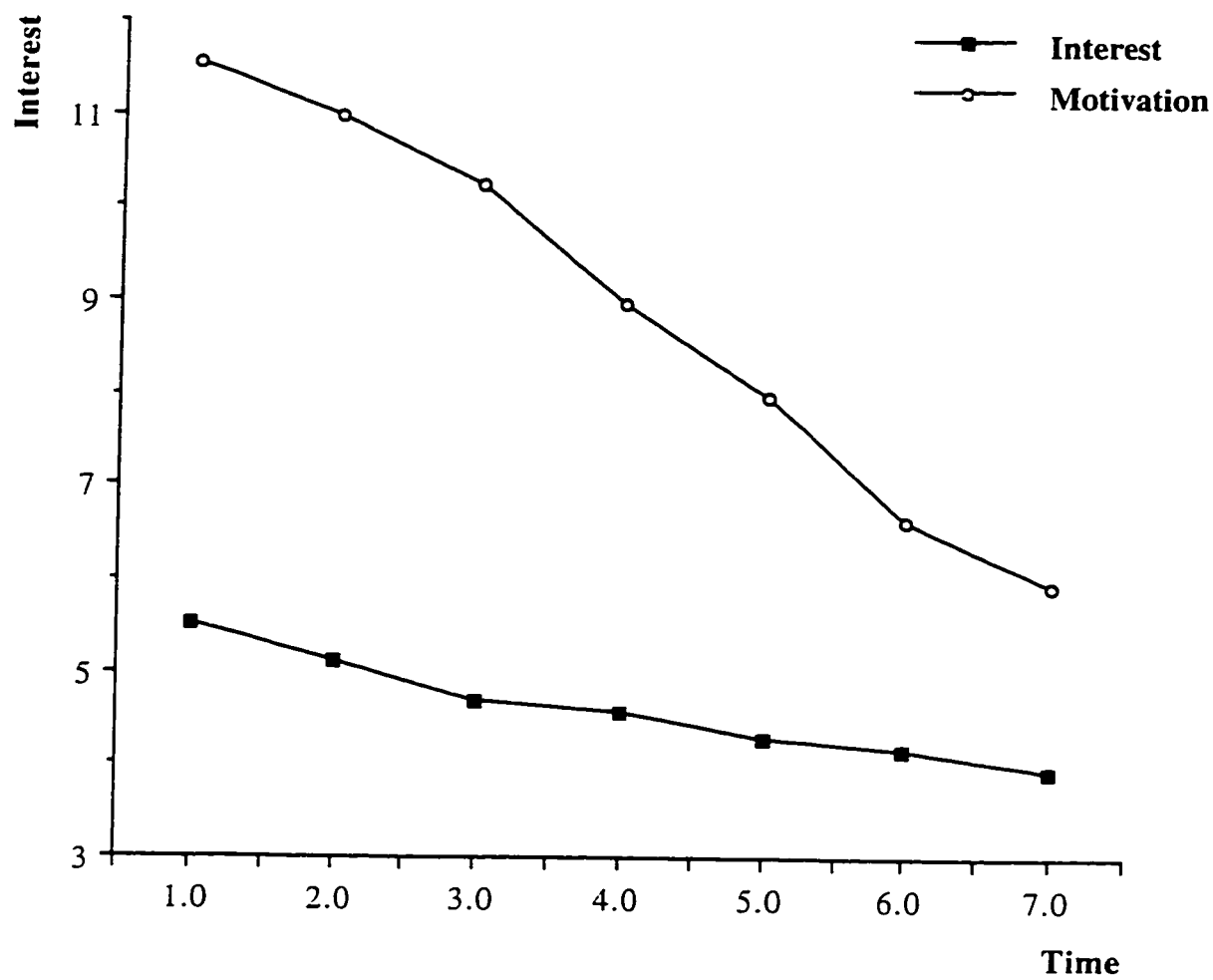


Figure 12. *Trend Analysis of Adjusted Marginal Time Means (Study 4)*

difference scores (postexperimental interest levels - initial interest levels) of each experimental condition. Preliminary analyses were first performed to evaluate if the data under study conformed to the statistical assumptions required by the ANOVA. A scan of the within-cells standardized distributions revealed no univariate outliers. The univariate within-cells distributions were approximately normal. ANOVA is robust to departures from homoscedasticity when the ratio of the largest to smallest size group is inferior to 4:1, when two-tailed tests are performed, and when there are no outliers (Tabachnick & Fidell, 1996). Even though missing values for the postexperimental interest levels required the deletion of 8 cases⁸, these requirements were met in the present study (ratio of largest n to smallest $n=1.11:1$: n challenge enhancement=20, n attentional involvement=18, n self-relevant rationale=18, n introduction of variety=18, n exploitation of stimulation=20, n control group=18). Sample within-cells variances were also compared across groups as an additional precaution. The ratio of largest to smallest variance was 1.72:1, which is quite inferior to the upper limit of 10:1 proposed by Tabachnick & Fidell (1996). In sum, the results of the preliminary analyses revealed no obvious departures from the assumptions underlying the ANOVA. The results of the ANOVA are reported in the following paragraph.

Descriptive statistics revealed that the attentional involvement condition is the only condition with a positive mean change in interest ($M=.44$). Thus, the interest levels of the majority of the participants in this condition have actually increased. The mean change in interest was 0 in the exploitation of stimulation condition. The levels of interest in this condition remained stable. The mean interest levels decreased in the four other conditions: challenge enhancement ($M=-.25$), self-relevant rationales ($M=-.50$), introduction of variety ($M=-.50$), and control group ($M=-1.17$). The omnibus test of mean differences in interest

⁸ The data gathered during the study contained no missing values. However, a small number of missing values were found in the postexperimental questionnaire. Cases containing missing data were excluded from the analyses.

change was marginally significant ($F_{(5,106)}=2.25, p=.05$). Post hoc comparisons were performed using Dunnett's procedure. Because the sample size of the groups were nearly equal, and because there were no serious heteroscedasticity problems, unequal sample sizes were accounted for by using the harmonic mean of number of cases per cell in Dunnett's test ($n_h=18.62$; Howell, 1992). Results revealed a significant difference in the change in interest between the attentional involvement condition, and the control group ($t_{D(6,106)}>2.55, p<.05$).

Second, postexperimental levels of motivation were compared. The mean level of additional experimental sessions that the participants were willing to volunteer for was 2.78 ($SD=1.71$) in the challenge condition, 4.39 ($SD=3.23$) in the attentional involvement condition, 3.25 ($SD=2.38$) in the self-relevant rationale condition, 2.07 ($SD=1.00$) in the introduction of variety condition, 3.62 ($SD=2.68$) in the exploitation of stimulation condition, and 2.73 ($SD=2.31$) in the control group. Albeit the mean levels of postexperimental motivation for the groups displayed a trend which corresponded to the pattern of results obtained for interest and motivation during the experiment, no significant differences were found in postexperimental levels of motivation ($F_{(5,82)}=1.63, p=.16$).

Interrelations Between Interest and Motivation

The interrelation between changes in interest and motivation levels was investigated using a bivariate regression, performed on the observed difference interest and motivation scores. These scores were obtained by subtracting the baseline values from the values at the end of the experiment, for interest and motivation. The distribution of the observed difference interest and motivation scores appeared approximately normal. The standardized distribution of the different interest and motivation scores displayed no outliers. Results of the bivariate regression revealed that change in interest predicted change in motivation significantly ($\beta=.48, t=5.87, p<.0001$). Change in interest explained 22% of the variance in motivational change

($F=34.48$, $p<.0001$). The distribution of the residuals of the regression adopted a normal configuration.

Postexperimental Feelings

Participants' feelings were evaluated after the free-choice period. Even though missing data in the postexperimental questionnaire resulted in the loss of 22 cases for the variables involved in the present analyses, the ratio of largest to smallest size group was 1.27:1. This ratio remained largely inferior to the upper limit of 4:1 set by Tabachnick and Fidell (1996). For all the variables considered, preliminary analyses revealed no apparent departures from the assumptions of normality and homoscedasticity. Also, no outliers were identified. There were no differences in feelings of competence, anxiety, happiness, optimism, discouragement, nor frustration between the experimental conditions. However, the omnibus test revealed a significant difference between the conditions in the level of tiredness following the free recall task. ($F_{(5,92)}=2.87$, $p<.05$). Post hoc comparisons were performed using Dunnett's procedure. Because the sample size of the groups were nearly equal, and because there were no serious heteroscedasticity problems, unequal sample sizes were accounted for by using the harmonic mean of number of cases per cell in Dunnett's test ($n_h=16.23$, n challenge enhancement=19, n attentional involvement=17, n self-relevant rationale=15, n introduction of variety=16, n exploitation of stimulation=15, n control group=16; Howell, 1992). No differences were found between challenge enhancement ($M=6.89$), self-relevant rationale ($M=6.00$), introduction of variety ($M=7.19$), exploitation of stimulation ($M=5.33$), and the control group ($M=7.06$). Yet, results revealed a significant difference in the level of tiredness between the attentional involvement condition ($M=4.76$), and the control group ($t_{D(6,106)}>2.55$, $p<.05$). Following the free recall task, the participants in the attentional involvement condition were significantly less tired than the participants in the control condition.

Impact of Interest-Enhancing Strategies on Free Recall Performance

A 6 X 7 mixed analysis of covariance (ANCOVA) was performed on recall performance. Performance scores were adjusted using the baseline performance scores as a covariate. The first independent variable, namely the experimental condition, was a between-participants measure comprising 6 levels: challenge enhancement, attentional involvement, self-relevant rationale, introduction of variety, exploitation of stimulation, and control condition. Here again, the more powerful "univariate" approach to repeated measures was preferred to the "multivariate" approach. Thus, time, as a within-participant factor, constituted the second independent variable. This variable consisted of seven levels, corresponding to the seven collapsed sequential recall performance scores obtained during the experiment.

Preliminary analyses were first performed to evaluate if the data under study conformed to the statistical assumptions required by the analysis of covariance. Within-cells standardized distributions were inspected and Mahalanobis' distances were computed ($\alpha=.001$) for the covariate and the dependent variable. No univariate or bivariate within-cells outliers were detected. The univariate within-cells distributions of the covariate and the dependent variable, as well as the bivariate distribution of the within-cells residuals, were approximately normal. Moreover, ANCOVA is robust to departures from multivariate normality when the number of participants within the cells is uniform and equal to a minimum of 20, when two-tailed tests are performed, and when there are no outliers (Tabachnick & Fidell, 1996). These requirements were met in the present study. The sample comprised 20 cases within each cell of the design. Even though ANCOVA is generally robust to violations of the homogeneity of variance assumption (Tabachnick & Fidell, 1996), sample within-cells variances were compared across groups for the dependent variable as an additional precaution. The ratio of largest to smallest variance was 4.84:1, which is quite inferior to the upper limit of 10:1 proposed by Tabachnick & Fidell (1996). A random selection of bivariate within-cells scatterplots between covariates

and dependent variables, and between dependent variables, were examined to identify potential departures from linearity. The bivariate distributions yielded fairly linear scattergrams. Moreover, as mentioned previously, the distribution of the standardized bivariate residuals within the cells appeared approximately normal. The correlations between all possible pairs of variables included in the analysis were inspected for multicollinearity. No correlations in excess of .90 were identified (Tabachnick & Fidell, 1996). The assumption of homogeneity of regression is deemed tenable since there is no reason to suspect the presence of an interaction between the independent variables and the covariate. In sum, the results of the preliminary analyses revealed no obvious departures from the assumptions underlying analysis of covariance. The results of the ANCOVA itself are reported in the following paragraphs.

Results revealed that the performance scores were significantly related to baseline recall scores ($F_{(1,113)}=66.90, p<.001$). The regression coefficient of recall scores on baseline recall was substantial and significant ($\beta=.59, t=8.17, p<.001$), and there was a moderate association between the covariate and the dependent variable (partial $\eta^2=.37$). The performance scores were also predicted significantly by the experimental condition ($F_{(5,113)}=2.58, p<.05$). A modest association was found between performance and experimental condition (partial $\eta^2=.10$). Time had no significant effect on recall performance ($F_{(6,684)}=1.55, p=.16$).

The impact of experimental condition on performance was further investigated using single degree of freedom contrasts, in which the experimental groups were compared to the control group. Alpha was fixed to .01, using a Bonferroni correction, to maintain a hypothesiswise error rate of 5%. Results revealed a significant difference between the adjusted marginal mean levels of performance in the control group (adjusted $M=7.62$), and in the exploitation of stimulation condition (adjusted $M=6.03, F_{(1,113)}=5.69, p<.05$). No significant differences were identified between the control group and the challenge enhancement (adjusted $M=7.46$), attentional involvement (adjusted $M=6.70$), self-relevant rationale (adjusted

$M=7.94$), and introduction of variety (adjusted $M=6.17$) conditions. In conclusion, initial performance was by far the best predictor of future task performance. Also, possibly because of the distraction factor involved in generating pleasant thoughts, performance in the exploitation of stimulation condition was significantly worse than performance in the control condition.

Chapter Summary and Discussion

The goal of Study 4 was to test the interest and motivation self-regulation model in the context of an experimental setting, in order to better control the unwanted influence of potential confounding factors. Participants were randomly assigned to one of six experimental conditions corresponding to five interest-enhancing strategy conditions (i.e., challenge enhancement, attentional involvement, self-relevant rationales, exploitation of stimulation, and introduction of variety), and to one control condition. The experimental procedure was double-blind. Interest-enhancing strategy use was manipulated while participants performed a tedious free recall computer task. Interest and self-determination levels were measured on several occasions during the experiment, and once after the experiment had been over for five minutes.

In line with the results obtained in Study 1, 2, and 3, it was hypothesized that attentional involvement was the only strategy directly related to subsequent interest and self-determination levels. Yet, because Study 4 was a first attempt at controlling interest-enhancing strategy use, the effect of the four remaining interest-enhancing strategies on interest and self-determination was also assessed.

The results of the manipulation checks revealed that the participants clearly understood the instructions, and that they used the interest-enhancing strategy pertaining to the condition to which they were assigned quite frequently. Also, participants' behavior during the free-choice period indicated that participants did not find the task interesting, nor intrinsically motivating. There were no differences between the results of the participants tested by the two experimenters. The vast majority of the participants believed the cover stories. Performance anxiety did not appear to influence the results. Social desirability was not a problem in the study sample. Finally, interest and self-determination baseline levels did not differ between the groups.

The evolution of interest and self-determination during the experiment was analyzed using a priori comparisons, and an exploratory MANCOVA. Both procedures yielded similar results. In congruence with the results of Study 1, 2, and 3, interest and self-determination levels were significantly higher in the attentional involvement condition than in the control condition. Yet, contrary to expectations, interest and self-determination levels were also significantly higher in the exploitation of stimulation condition than in the control group. That is, generating pleasant thoughts was directly related to greater interest and self-determination. This finding is in contradiction with the results of Study 1 and 2, wherein exploitation of stimulation displayed an indirect negative impact on interest and self-determination, through the mediation of attentional involvement. In Study 3, no direct or indirect association had been found between exploitation of stimulation and subsequent levels of interest and self-determination. Thus, the findings of the four studies regarding this strategy are inconsistent. This lack of coherence will be discussed in more details in the "General Discussion" chapter. Also in opposition to the results of Studies 1, 2, and 3, self-determination was higher in the provision of self-relevant rationales group than in the control group. Reminding oneself that the task was helpful in developing memory skills had a direct and positive impact on self-determination. This particular finding will also be further discussed in the context of the "General Discussion". In addition to the main effect of experimental conditions, the MANCOVA identified a significant main effect of time on interest and motivation. Specifically, for all six experimental groups, interest and motivation decreased steadily during the course of the experiment.

Interest and self-determination levels were also assessed five minutes after the participants had completed the experimental task. Changes between initial and postexperimental interest levels were analyzed by performing a oneway analysis of variance on the observed difference scores. Attentional involvement was the only condition with a positive

mean interest change. Thus, the level of interest of the majority of the participants in the attentional involvement group increased following the experimental procedure. Changes in interest were null or negative in all other conditions. Moreover, attentional involvement was the only condition wherein the change in interest was significantly different from the control group. No differences were found in the postexperimental levels of motivation between the experimental conditions.

The interrelations between changes in interest and motivation levels during the experiment was analyzed by performing a bivariate regression on the observed interest and self-determination difference scores. Gains in interest were significantly associated with gains in self-determination.

Finally, no differences were identified between the experimental conditions for most postexperimental feelings. However, following the experimental task, the participants in the attentional involvement condition reported being less tired than the participants in the control group. Also, the performance on the free recall task was not affected by the experimental conditions, except for exploitation of stimulation. In this condition, the performance was significantly worse than in the control group.

To summarize, in accordance with earlier results, participants in the attentional involvement condition displayed significantly more interest and self-determination during the task than the participants in the control group. Also, the participants in this condition revealed positive gains in interest following the experiment, and this change in interest levels was significantly different from the negative changes that occurred in the control group. The participants in the attentional involvement condition were also less tired following the experiment than the participants in the control condition. While attentional involvement displayed an impact on interest and self-determination that carried over Studies 1,2 ,3 and 4, the results pertaining to exploitation of stimulation and self-relevant rationales were different in

the present study. That is, the interest and motivation levels of the participants in the exploitation of stimulation condition during the experiment were significantly superior to those of the control group. The self-determination levels of the participants in the self-relevant rationales condition during the experiment were also significantly greater than in the control group.

CHAPTER SIX

GENERAL DISCUSSION

Summary of Findings

On the basis of the interest and motivation self-regulation model proposed by Sansone and her colleagues (1992), and of the self-determination theory proposed by Deci and Ryan (1985, 1991), the objective of the present research thesis was to assess the interrelations between interest-enhancing strategy use, interest, and self-determination. As can be recalled from the introduction, the present thesis aimed to test four general hypotheses.

Hypothesis 1. In agreement with the interest and motivation self-regulation model proposed by Sansone and her colleagues, it was hypothesized that people would use interest-enhancing strategies when they are faced with an uninteresting task. Five interest-enhancing strategies were investigated: Challenge enhancement, provision of self-relevant rationales, attentional involvement, exploitation of stimulation from the environment, and introduction of variety within the task.

Hypothesis 2. It was hypothesized that interest-enhancing strategy use would be associated positively with higher interest levels. That is, a more frequent use of each of the five proposed interest-enhancing strategies was expected to be associated with higher interest levels.

Hypothesis 3. Interest was hypothesized to be associated positively with self-determination, as defined by Deci and Ryan's self-determination theory (1985, 1991). Thus, higher interest was hypothesized to be associated with greater self-determination.

Hypothesis 4. Interest-enhancing strategy use was hypothesized to be positively associated with long term changes in interest, and long term changes in interest were hypothesized to be associated with long term changes in self-determination. That is, frequent

use of interest-enhancing strategies was hypothesized to predict long term gains in interest directly, and long term gains in self-determination indirectly, through interest.

Four studies were designed to test these hypotheses. The specific goals, hypotheses, and results of each of these studies are recapitulated below.

Study 1

This study was an initial attempt at tackling the research questions outlined above. Hence, its focus was exploratory. The goal of Study 1 was to generate a model of interest and motivation self-regulation on the foundation of the works of Sansone (1992), Deci (1985, 1991), and their colleagues. Specifically, Study 1 endeavored to provide a preliminary test of Hypotheses 1, 2, and 3.

In support of Hypothesis 1, descriptive statistics indicated that the participants used challenge enhancement, provision of self-relevant rationales, attentional involvement, exploitation of stimulation from the environment, and introduction of variety, while performing three uninteresting academic tasks: Routine studying, studying for exams, and writing exams.

Hypothesis 2 was not initially supported by the results of the structural modeling procedure. The first modeling attempt, wherein all five interest-enhancing strategies were hypothesized to relate to interest, failed to identify any significant relationships between interest-enhancing strategies and interest. A revised model was proposed on the foundations of logical, theoretical, and statistical considerations. That is, because it was the only strategy correlated with all others, and because its use had been associated with positive feelings and with interest, attentional involvement was hypothesized to mediate the impact of the other four interest-enhancing strategies on interest. Results provided partial support for the revised model. Attentional involvement was moderately and positively related to interest. Also, attentional involvement successfully mediated the impact of challenge enhancement, provision

of self-relevant rationales, and stimulation from the environment, on interest. These three strategies were moderately related to attentional involvement. Challenge enhancement and provision of self-relevant rationales were positively related to attentional involvement. In opposition with expectations, the relationship between exploitation of stimulation and attentional involvement was negative. Also in disagreement with the revised hypothesized model, introduction of variety was not related with attentional involvement.

Hypothesis 3 was supported by the results of the modeling procedure performed in Study 1. In the initial model, as well as in the revised model, interest displayed a moderate and positive relationship with self-determination.

In sum, while Hypothesis 1 and 3 were readily supported by the results of Study 1, initially, the results offered no support for Hypothesis 2. This was problematic since the relationship between interest-enhancing strategies and interest is a very important component of the proposed interest and motivation self-regulation model. However, a revised model was proposed and tested, and the results indicated that four of the five proposed interest-enhancing strategies were directly or indirectly related to interest.

Study 2

The goal of Study 2 was to replicate the exploratory interest and motivation model obtained in Study 1. On the basis of the results obtained in Study 1, the objective of Study 2 was to provide an additional test of Hypotheses 1 and 3, and of a revised version of Hypothesis 2. That is, challenge enhancement, provision of self-relevant rationales, and exploitation of stimulation, were hypothesized to be associated with attentional involvement. The relationship between challenge enhancement and attentional involvement, and the relationship between provision of self-relevant rationales and attentional involvement, were expected to be positive. The relationship between exploitation of stimulation and attentional

involvement was expected to be negative. Attentional involvement was the only strategy that was expected to display a direct and positive association with interest.

Again, in support of Hypothesis 1, descriptive statistics indicated that the participants used challenge enhancement, provision of self-relevant rationales, attentional involvement, exploitation of stimulation from the environment, and introduction of variety, to a moderate extent while performing an uninteresting academic tasks: Routine studying.

Regarding Hypothesis 2, the results of the structural modeling procedure replicated the results obtained in Study 1. Challenge enhancement and provision of self-relevant rationales were moderately and positively related to attentional involvement. As in Study 1, exploitation of stimulation was negatively related to attentional involvement, although the magnitude of this relationship was smaller than in Study 1. Attentional involvement was moderately and positively related to interest. Introduction of variety was unrelated to attentional involvement.

Consistent with earlier results, Hypothesis 3 was supported by the results of the modeling procedure performed in Study 2. Specifically, interest displayed a moderate relationship with self-determination.

In sum, the revised interest and motivation self-regulation model obtained in Study 1 was successfully cross-validated in Study 2. The results of Study 2 provided support for Hypotheses 1 and 3, as well as partial support for the revision of Hypothesis 2.

Study 3

Study 3 was designed to provide a longitudinal test of the interest and motivation self-regulation model. Thus, like Study 1 and 2, the goal of Study 3 was to test Hypotheses 1 and 3, as well as the revised Hypothesis 2. In addition, interest-enhancing strategies, interest, and self-determination were measured twice, at a 10 weeks interval, to permit a test of Hypothesis 4.

As in Studies 1 and 2, results supported Hypothesis 1. Descriptive statistics indicated that the participants used challenge enhancement, provision of self-relevant rationales, attentional involvement, exploitation of stimulation from the environment, and introduction of variety, while performing an uninteresting academic tasks: Routine studying.

Again, the revised Hypothesis 2 was partially supported by the results of the structural modeling procedure. In agreement with the results of Studies 1 and 2, challenge enhancement and provision of self-relevant rationales were moderately and positively related to attentional involvement. Also, attentional involvement was moderately and positively related to interest, and introduction of variety was unrelated to attentional involvement. Yet, in opposition to the results of Studies 1 and 2, exploitation of stimulation was unrelated to attentional involvement.

Consistent with earlier results, Hypothesis 3 was supported by the results of the modeling procedure performed in Study 3. Specifically, gains in interest displayed a moderate relationship with gains in self-determination.

Results of the base-free measurement of change modeling procedure offered partial support for Hypothesis 4. That is, the revision of Hypothesis 2 held over time, and attentional involvement was the only interest-enhancing strategy use which revealed a positive relationship with gains in interest. Attentional involvement predicted gains in interest over a 10 week period. The magnitude of this relationship was modest.

To summarize, the longitudinal results obtained in Study 3 were mostly consistent with the cross-sectional results of Study 1 and Study 2 . With the exception of the negative relationship between exploitation of stimulation and attentional involvement, the structural relationships obtained in Study 1 and 2 were replicated in Study 3.

Study 4

The objective of Study 4 was to provide an experimental test of the interest and motivation self-regulation model. In this study, the manipulation of interest-enhancing strategy use served to test Hypotheses 2 and 3. Participants were randomly assigned to one of six experimental conditions corresponding to five interest-enhancing strategy conditions (i.e., challenge enhancement, attentional involvement, self-relevant rationales, exploitation of stimulation, and introduction of variety), and to one control condition. Interest and self-determination levels were measured repeatedly while participants performed a monotonous free recall computer task. Interest and motivation levels were also evaluated after the experimental task had been over for five minutes.

Consistent with the revision of Hypothesis 2, and with the results of Studies 1, 2, and 3, results revealed that interest and self-determination were significantly higher in the attentional involvement condition, than in the control condition. In opposition to the results of Studies 1 and 2, wherein a negative relationship was identified between exploitation of stimulation and attentional involvement, and contrary to the results of Study 3, wherein no relationship was found between exploitation of stimulation and attentional involvement, interest and self-determination were also higher in the exploitation of stimulation condition in Study 4. Also, in contrast with the results of Studies 1, 2, and 3, provision of self-relevant rationale displayed a direct impact on self-determination in Study 4. Self-determination was higher in the self-relevant rationale group than in the control group.

Also in agreement with the revision of Hypothesis 2, attentional involvement was the only condition in which the mean change between initial and postexperimental interest levels were positive. Changes were null or negative in the other conditions. Moreover, the mean change in interest between the initial and postexperimental time points was significantly higher in the attentional involvement condition than in the control group. By comparison with the

control group, the other experimental conditions displayed no significant changes in interest between the initial and postexperimental measurement points. No differences between conditions were identified regarding postexperimental levels of motivation.

In support of Hypothesis 3, observed interest difference scores predicted observed self-determination difference scores. Thus, gains in interest were significantly associated with gains in self-determination.

Finally, emotional and behavioral consequences were assessed in an exploratory fashion for each experimental condition. Two noteworthy findings emerged. Participants in the attentional involvement condition were less tired than participants in the control group. This indicated that making the effort to involve one's attention in the task, thereby increasing one's interest and motivation, was less exhausting than doing nothing to fight boredom while performing the task. Experiencing and processing unpleasant feelings such as boredom while doing a task may result in a greater cognitive and emotional demand and, consequently, in more fatigue. Also, even though exploitation of stimulation had a positive impact on interest and self-determination, participants in this condition performed significantly worse on the free recall task than the participants in the control group. It is conceivable that a strategy that channels the attention away from the task would hinder performance. Thus, the usefulness of this strategy appears questionable.

In sum, results pertaining to the attentional involvement condition were congruent with the results obtained in Studies 1, 2, and 3. Alternatively, in contrast to prior findings, exploitation of stimulation had a positive impact on interest and self-determination, and provision of self-relevant rationale a positive direct impact on self-determination.

Coherence Within the Findings of Study 1, Study 2, Study 3, and Study 4

Hypothesis 1. Results of studies 1, 2, and 3 are in perfect agreement: Participants reported using challenge enhancement, provision of self-relevant rationales, attentional involvement, exploitation of stimulation, and introduction of variety, to a moderate extent when they have to perform uninteresting academic tasks. For example, students reported making efforts to challenge themselves to accomplish a set amount of work in a set amount of time, to remind themselves of their personal goals for performing the task, to immerse themselves in the task, to provide themselves with additional stimulation in the form of food or music, and to vary their approach to the task. That is, participants displayed a number of creative behaviors in an attempt to alleviate boredom. The question is: Was this recourse to interest-enhancing strategies useful?

Hypothesis 2. Results of studies 1, 2, 3, and 4, offered partial support for Hypothesis 2. It was initially hypothesized, in Study 1, that all five interest-enhancing strategies would impact on interest and self-determination. This hypothesis was not supported and a new model was devised wherein attentional involvement was hypothesized to mediate the impact of the other four interest-enhancing strategies on interest and motivation. As previously mentioned, this modification was performed on the basis of intuitive, substantive, and statistical considerations. From a speculative point of view, attentional involvement appeared to be the interest-enhancing strategy most likely to serve as an intermediate between the other strategies, interest, and self-determination. From a substantive point of view, attentional involvement has been associated with interest. According to Csikszentmihalyi (1975, 1980), the merging of awareness and action occurs within a pleasurable state called "flow". Csikszentmihalyi (1975, 1980) argues that flow fulfills an important function in the experience of interest. Also, from a statistical point of view, attentional involvement was correlated to all other four strategies.

The results of Studies 1, 2, 3, and 4, mostly supported the revised hypothesized model. That is, results revealed that challenge enhancement and provision of self-relevant rationales had an indirect positive impact on interest and self-determination, through attentional involvement. This finding emerged consistently in Studies 1, 2, and 3. Because of practical constraints, the indirect impact of challenge enhancement and provision of self-relevant rationales was not evaluated in Study 4. In addition, the positive impact of attentional involvement on interest levels appeared consistently in all four studies. Therefore, in spite of its modest magnitude, this effect was robust. The results of Studies 1, 2, 3, and 4 indicated that attentional involvement played a central role in the self-regulation of interest and motivation. Participants who used this strategy more frequently displayed higher interest and self-determination towards less-interesting tasks. This finding is in agreement with recent conceptualizations in the area of self-regulation. For instance, Baumeister and his colleagues (1994) contend that the regulation of attention is the most widely used and the most effective self-regulation technique. These authors (Baumeister et al., 1994) believe that this principle holds whether self-regulation targets emotions, appetites and desires, actions, or cognitive processes.

In disagreement with the revised model, exploitation of stimulation and introduction of variety failed to positively influence attentional involvement, interest, or motivation. The results pertaining to exploitation of stimulation were quite diverse. These findings will be discussed in the following subsection. Alternatively, albeit in opposition with the revised hypothesized model, the findings pertaining to introduction of variety were stable across the four studies. No direct or indirect associations were detected, in all four studies, between introduction of variety and interest, nor self-determination. Thus, in spite of the fact that participants used this strategy to a moderate extent, it did not prove effective in altering interest and motivation. This finding is contrary to the results obtained by Sansone and her colleagues

(1992). Maybe this discrepancy stems from the difference in the characteristics of the uninteresting tasks under study. The tasks utilized in the present thesis were mostly cognitive in nature (i.e., routine studying, studying for exams, writing exams, and memorizing lists of syllables). In the second study presented in their article, Sansone and her colleagues (1992) evaluated the impact of interest-enhancing strategies on interest and motivation. The participants were subjected to an uninteresting copying task. Sansone and her colleagues (1992) assessed the use of introduction of variety by coding the difference in the scripts that participants used in the copying task and found a positive association with interest and motivation. A task comprising a more obvious manual component, such as lettering, could provide a better opportunity to use introduction of variety. Additional research is in order to investigate this possibility, and to determine whether introduction of variety is useful in the self-regulation of interest and motivation.

Hypothesis 3. In all four studies, a moderate and positive association was identified between interest and self-determination. This finding was robust. In accordance with the theoretical proposition made by Deci (1992), interest related to the level of self-determination of extrinsic behaviors. Thus, interest was not exclusive to intrinsic motives. Albeit extrinsic behaviors are, by definition, undertaken for instrumental purposes, in the present thesis, their performance did not preclude the experience of interest when the level of self-determination was sufficiently high. That is, interest self-regulation appears to be a mechanism by which people heighten the level of self-determination of their extrinsic behaviors.

Hypothesis 4. Results of Study 3 partially supported Hypothesis 4. The revised model tested in Study 1 and 2 mostly held over time. Save for the negative relationship between exploitation of stimulation and attentional involvement, the structural relationships identified in Studies 1 and 2 were replicated using a longitudinal design. Challenge enhancement and provision of self-relevant rationales were indirectly associated with gains in

interest, through the mediation of attentional involvement. Attentional involvement directly predicted gains in interest between Time 1 and Time 2. Gains in interest, in turn, predicted gains in self-determination. Introduction of variety was unrelated to attentional involvement, to gains in interest, and to gains in self-determination. Although these findings were congruent with their cross-sectional counterparts, additional research is necessary in order to further assess their validity.

Inconsistencies Within the Results of Study 1, Study 2, Study 3, and Study 4

Incoherent results emerged with respect to the impact of certain interest-enhancing strategies on interest. Thus, these inconsistencies pertain to Hypothesis 2. These incongruent results concern two particular strategies: Exploitation of stimulation and provision of self-relevant rationales.

Exploitation of stimulation. The results referring to exploitation of stimulation are notably inconsistent. In Study 1 and Study 2, this strategy displayed a negative indirect impact on interest, through the mediation of attentional involvement. No direct or indirect relationships were identified between this strategy, attentional involvement, interest, nor self-determination, in Study 3. In Study 4, this strategy had a direct positive impact on both interest and self-determination. Yet, participants in this condition performed worse than the control group on the free recall task. These troublesome findings bear reflection. What happened? Different possible scenarios can be evoked.

Let's first consider the discrepancies between Studies 1, 2, and 3. Exploitation of stimulation displayed the lowest reliability value amongst the subscales of the Interest Enhancing Strategies Scale. Hence, measurement error could have been responsible for the fluctuations between the results of Studies 1, 2, and 3. Alternatively, it is possible that the results of Study 1, 2, and 3, reflect reality. The eventuality of a negative association between

this strategy and attentional involvement is intuitively appealing since exploitation of stimulation, by definition, takes the focus away from the task. This strategy could have a negative impact in the short run, yet no long term effects. In future studies, the measurement of exploitation of stimulation could be further improved in order to evaluate these possibilities.

Second, let's reflect on the findings particular to Study 4. The dissimilarity between the results of Study 4, and the three other studies, is likely to stem from the difference in the operationalization of exploitation of stimulation. In the Interest-Enhancing Strategies Scale, which was used in Studies 1, 2, and 3, exploitation of stimulation referred to physical stimuli such as drinking pop, listening to music, etc. In the experimental context of Study 4, participants were asked to generate pleasant thoughts. Thus, in Study 4, stimulation, albeit still originating from outside the task itself, was of a cognitive nature. A different operationalization approach was adopted so that the induction for exploitation of stimulation could be provided in written format, and implemented without the addition of physical props, just like the four other interest-enhancing strategies. In hindsight, striving for consistency within the method of Study 4 appeared to have induced inconsistencies between the findings of Study 4 and the other studies of the thesis. The two interpretation of exploitation of stimulation possibly represented two different strategies, and this may have led to different results. It would be interesting, in the context of future studies, to purposefully attempt to differentiate between the impact of the recourse to internal and external stimulation, on subsequent levels of interest and motivation. Also, in Study 4, no performance feedback was given to the participants. It would also be interesting to investigate whether the positive impact of pleasant thoughts on interest and motivation would last, if participants realize that it hinders their performance.

Provision of self-relevant rationales. Use of self-relevant rationales displayed a consistent indirect effect on interest, through attentional involvement, in the self-report studies.

In contrast, in Study 4, a direct effect of self-relevant rationales on self-determination was identified. Again, a possible explanation lies within the difference in the way in which this strategy was operationalized. In Studies 1, 2, and 3, the Interest-Enhancing Strategies Scale questionnaire items were general (e.g., "I think of reasons to perform the activity"). The participants are encouraged to refer to their own self-relevant rationales. In contrast, in Study 4, a specific rationale was given to the participants. They were told that the task would help to improve their memory. Maybe the specificity of the instructions induced a stronger effect. It would be interesting to investigate this eventuality in future research.

Theoretical Implications

The Interest and Motivation Self-Regulation Model of Sansone and her Colleagues (1992)

Following the example of Sansone and her colleagues (1992), an interest and motivation self-regulation model based on interest-enhancing strategy use was proposed and tested in the context of the present research project. Yet, the hypotheses and results of the present thesis differ partially from those of Sansone and colleagues (1992), and these differences entail theoretical consequences.

First, Sansone and her colleagues focused on three interest-enhancing strategies: Challenge enhancement, exploitation of stimulation, and introduction of variety. In the present thesis, this number was expanded to five. That is, provision of self-relevant rationales and attentional involvement were successfully included in the interest and motivation model. The results of the present thesis suggested that these two strategies can contribute to our understanding of interest and motivation self-regulation. Future studies could attempt to further expand the model by identifying and investigating new interest-enhancing strategies. Boring activities in different life sectors (e.g., different work settings, different leisure or sport

activities, housework, etc.) could be identified using the feedback from specialized focus groups. These focus groups could also provide suggestions regarding the possible strategies that are used to cope with the boring activities. Complementary information could be obtained by the behavioral observation of people performing these boring activities, and by interviews with these people. The resulting pool of strategies could be further tested using surveys and experimental designs.

Second, in the present thesis, a hierarchy was identified between interest-enhancing strategies. Attentional involvement was the only interest-enhancing strategy reliably associated with interest and self-determination, and this strategy mediated the impact of challenge enhancement, provision of self-relevant rationales, and, occasionally, exploitation of stimulation. Thus, the investigation of the interrelations between interest-enhancing strategies is also liable to be beneficial to our comprehension of interest and motivation self-regulation. Future research endeavors could aim to replicate these findings and to broaden our understanding of the interrelations between interest-enhancing strategies. For instance, the temporal precedence of challenge enhancement and provision of self-relevant rationales over attentional involvement was not investigated in Study 4. Future studies performed in experimental settings could assess the impact of the sequential use of challenge enhancement and attentional involvement on interest and motivation, as well as the impact of the sequential use of provision of self-relevant rationales and attentional involvement on interest and motivation. Additional hierarchical relationships could also be researched. For instance, provision of self-relevant rationales could conceivably be a causal antecedent of challenge enhancement. In the present thesis, both strategies were consistently correlated. From an intuitive perspective, reminding oneself of personal reasons for performing the task could be an incentive to create challenges for oneself.

Third, and most importantly, the model proposed by Sansone and her colleagues (1992) supplied no theoretical propositions pertaining to the nature of motivation and its evolution. Motivation is not defined in this article (Sansone et al., 1992) and it is simply operationalized as the intention of performing a behavior. This is no minor omission considering that the article claims to propose a motivation self-regulatory process. In the present thesis, it was argued that Deci and Ryan's self-determination theory (1985, 1991) provides interesting theoretical propositions regarding the nature of motivation, and the stages of its evolution. Thus, it was considered a valuable complement to the interest and motivation self-regulation model proposed by Sansone and her colleagues (1992). Results indicated that interest was consistently related to self-determination, and gains in interest covaried with gains in self-determination. Therefore, it is argued that the role played by interest-enhancing strategy use in interest and motivation self-regulation can be better understood when motivation is conceptualized from a self-determination perspective (Deci & Ryan, 1985, 1991).

Deci and Ryan's Self-Determination Theory (1985, 1991)

The joint investigation of the interest and motivation self-regulation model proposed by Sansone and her colleagues (1992) and self-determination theory (Deci & Ryan, 1985, 1991) also bears theoretical consequences for Deci and Ryan's perspective (1985, 1991).

First, it is unclear in self-determination theory whether interest is considered an antecedent or a consequence of self-determination. In the present thesis, interest is hypothesized to mediate the impact of interest-enhancing strategies on self-determination. That is, interest is hypothesized to precede self-determination. Results revealed that interest had a modest to moderate effect on self-determination. Hence, it is contended that future research could benefit from considering the potential antecedent status of interest on self-determination. Also, experiential pleasant factors such as interest have long been considered capital in the

intrinsic motivation phenomenon. The fact that the antecedent role of interest was successfully identified in the present thesis suggests that experiential processes may also play a significant role in the development and evolution of self-determined *extrinsic* motivation.

Second, from a purely speculative point of view, two interest-enhancing strategies can be intuitively related to well established antecedents of self-determination: Feelings of competence and feelings of self-determination (Deci & Ryan, 1985, 1987, 1991). Specifically, challenge enhancement is liable to predict feelings of competence, while provision of self-relevant rationales could possibly predict perceived autonomy. Therefore, it is conjectured that interest is not the only construct likely to mediate the impact of interest-enhancing strategies on self-determination. Future studies could investigate the possibility that some interest-enhancing strategies, such as challenge enhancement and provision of self-relevant rationales, have an indirect impact on self-determination through mediating factors like perceived competence and autonomy.

Third and most essentially, the intrapersonal processes at work in the internalization of self-determination have been largely neglected by past research. Self-determination theory (Deci & Ryan, 1985, 1991) postulates that the internalization of extrinsic regulation is mostly facilitated or hindered by the social environment. Paradoxically, little attention has been devoted to self-influence. It is argued here that, by using interest-enhancing strategies, people can actively contribute to the development of self-determination, through the mediating impact of interest. The present thesis identified consistent findings that could serve as a basis for the investigation of self-influence in the development of self-determination.

Applications

Everyday, individuals perform a variety of activities. Of these activities, some are quite interesting, while others are less-interesting and can even be considered boring. Most people have few problems performing interesting activities because they are fairly enjoyable. However, the performance of less-interesting tasks is not always a pleasant pursuit. With less-interesting activities, motivation to perform the activity is often low. Although many activities are not inherently interesting, their completion is often deemed necessary. For example, few people enjoy filling their income tax forms, cleaning their house, or sitting in traffic jams. In the present study, most students were not thrilled by routine studying, studying for exams, and writing exams. Yet, these tasks are, by definition, an integral part of students' lives. While performing these tasks can be tedious and trying, it is essential to the obtention of a university degree. Most authors agree that boredom is dysfunctional and must be alleviated (e.g., Mikulas & Vodanovitch, 1993; O'Hanlon, 1981). In the past, recommendations for interventions pertaining to interest and motivation have typically focused on altering the features of the physical or social environments (e.g., Deci & Ryan, 1987; Kopp, 1982). The results of the present thesis suggest that boredom and lack of motivation can be approached differently. That is, by shifting the focus from the context to the individual, as well as looking at how interest and motivation are generated when they are lacking, new intervention venues for interest and motivation can be proposed.

Specifically, the results of the present thesis suggested that people can transcend boredom and generate interest and motivation, when they are not spontaneously forthcoming, by using interest-enhancing strategies. Albeit the participants reported using all five proposed interest-enhancing strategies to a moderate extent, the results indicated that the strategies were not equally effective. That is, the results of Studies 1, 2, and 3, indicated that challenge

enhancement and provision of self-relevant rationales had an indirect positive impact on interest and motivation. Moreover, the results of Studies 1, 2, 3, and 4, revealed a consistent direct positive impact of attentional involvement on interest, and a positive indirect impact of attentional involvement on self-determination. Introduction of variety had no direct or indirect impact on interest and self-determination in Studies 1, 2, 3, and 4. In light of these findings, intervention programs could attempt to encourage people to use the helpful strategies more systematically, and to avoid the ineffective strategies. Specifically, the use of challenge enhancement, provision of self-relevant rationales, and attentional involvement could be promoted. With the exception of Study 4, in the present thesis, the focus was on the spontaneous use of these strategies. Yet, even if these strategies are self-regulated by definition, it can be argued that their efficient use is a skill that can be trained and improved like any other ability. In the studies of the present thesis, although the majority of people used the strategies to a moderate extent, interest-enhancing strategy use was normally distributed, which indicated that there was a certain amount of interindividual variance in the recourse to these self-regulation techniques. Workshops on interest and motivation self-regulation could first educate people by giving them information pertaining to the beneficial interest-enhancing strategies. Conscious awareness of the usefulness of challenge enhancement, provision of self-relevant rationales, and attentional involvement, is likely to constitute a first step towards a more systematic self-regulation of interest and motivation. Second, interventions could also focus on developing the abilities necessary for the use of these strategies. For example, challenge enhancement could be facilitated by training people to identify efficient proximal subgoals. Also, the use of self-relevant rationales presupposes a certain knowledge of one's values and long term goals. Exercises intended to develop self-knowledge and to clarify one's goals could be a valuable way to prepare people to use this strategy. Most importantly, people could be encouraged to exercise their ability to immerse their attention on the task at hand. It is

not easy to concentrate at will. Oriental traditions in mind control techniques, such as meditation, argue that the natural state of the mind is not order but chaos. It is true that consciousness has a natural tendency to drift. It is difficult to keep our attention focused on anything for any length of time (Csikszentmihalyi, 1993). Albeit time consuming, training in internal discipline and attention control (e.g., meditation exercises) is liable to provide a useful foundation for interest and motivation self-regulation.

Because introduction of variety did not successfully predict attentional involvement, interest, and self-determination, in the present thesis, it did not appear to be a very useful interest-enhancing strategy. Provided that this finding is corroborated by future studies, intervention programs could warn people about its ineffectiveness. Instead, people could be encouraged to use more helpful strategies, thereby managing their energy more productively. Also, considering that focusing on stimulation from the physical environment displayed a negative indirect impact on interest and motivation, and that focusing on pleasant internal stimulation had a negative impact on performance, it would be particularly important to study these potentially self-defeating strategies. If it was demonstrated that this strategy reliably led to the occurrence of negative consequences, recommendations should be made against its use.

Although the present results offer promising guidelines for applied intervention, it is important to acknowledge that these recommendations are tentative. Much more fundamental and applied research is needed to validate these suggestions, and to identify optimal approaches to interest and motivation self-regulation.

Limitations

The results of Studies 1, 2, 3, and 4, mostly supported the revised interest and motivation self-regulation model. However, it is important to acknowledge that these studies

were not exempt of various psychometric, methodological, statistical, and theoretical limitations.

Psychometric Limitations

First, from a psychometric perspective, the interest-enhancing strategies scale could be further improved to yield more reliable estimates of interest-enhancing strategy use. Also, studies 1, 2, 3, and 4 were liable to the various problems pertaining to self-report measures. For self-report measures to be accurate, participants must have access to the information they are asked to provide. Sansone and her colleagues (1992) demonstrated in their experiments that participants possessed both implicit and procedural knowledge regarding interest-enhancing strategy use. Also, interest and motivation are theorized to be conscious phenomena (Deci, 1992; Sansone, 1992). On the basis of these considerations, it was surmised that participants were likely to be able to provide the required information. For self-report measures to be accurate, participants must also choose to report the information accurately and truthfully. By making the participation to the studies of the present thesis anonymous and confidential, and by explicitly asking the participants to answer the questionnaires as honestly as possible, biases such as social desirability were hopefully kept at a minimum. However, future studies could develop different measures designed to assess various dimensions of the constructs composing the interest and motivation self-regulation model, to assess whether the results of Studies 1, 2, 3, and 4, were affected by the self-report format of the measures. For instance, the convergent and discriminant validity of measures using different rating techniques (e.g., Likert scales, semantic differential scales, codification of observed verbal or non-verbal behaviors, etc.) could be assessed using a multitrait multimethod approach (e.g., Bagozzi & Yi, 1990; Byrne, 1989; Campbell & Fiske, 1959). The satisfactory measures could be utilized as indicators in a subsequent test of the interest and motivation self-regulation model.

Methodological Limitations

From a methodological outlook, Studies 1, 2, and 3 were performed using a correlational design. The lack of experimental control over potential confounding influences precludes ruling out the possibility of spurious significance in these studies. Study 4 was designed to remedy to this methodological weakness. Yet, Study 4, alternatively, was liable to the external validity threats that are common to experimental designs. That is, it is unclear whether the results obtained in the artificial laboratory setting would generalize to real life settings. The fact that the majority of the results carried over four studies performed using various methodologies offers strong support to those findings that were consistent between the studies. However, the same cannot be said for inconsistent findings. Because it is unclear whether the inconsistencies in the results of the four studies originate from true fluctuations in the data or from methodological problems, the incoherent results (e.g., the relationship between exploitation of stimulation and attentional involvement) are difficult to interpret. As described in the section pertaining to the incoherent results between Studies 1, 2, 3, and 4, additional research is necessary to further investigate the factors responsible for these inconsistencies.

Restrictions pertaining to the generalizability of the results obtained in the present studies must also be mentioned. First, the possibility of sample biases must be considered. University students participated in the four studies of the present thesis. Additional studies involving different groups of participants are required before the results obtained in the present thesis can be generalized to other populations. For example, future research could target participants of different age groups and various socioeconomic backgrounds. Also, the samples involved in the present thesis comprised a greater proportion of women than men. No gender differences were identified in Study 1 and 3. Yet, in Study 2, women used challenge enhancement and introduction of variety significantly more often than men, and women

reported significantly higher self-determination than men. The sample of Study 4 comprised only women. Thus, it is unclear at this point in time whether the interest and motivation self-regulation model is equally valid for both genders. Additional studies, focusing on potential gender differences, are required to determine if the interest and motivation self-regulation model reliably applies to men. For instance, an attempt could be made to replicate the results of Study 4 with a sample of men. Also, cross-sectional and longitudinal studies surveying large numbers of men and women could be undertaken in order to perform a structural invariance test of the structural relationships composing the interest and motivation self-regulation model.

The generalizability of the results is also hindered by the specificity of the life domain and target tasks that were studied in the present thesis. Studies 1, 2, and 3, were performed in an academic context, and the uninteresting component was provided by studying behaviors. The free recall task utilized in Study 4 shares one of the main components of studying behaviors: It is an exercise in retention. Boring tasks are an integral part of our experience, and they can be found in a wide variety of life settings. Additional studies, performed in various contexts and involving diverse uninteresting tasks, are required to support the inferences drawn from the results of the present studies.

Statistical Limitations

Although great care was taken to analyze the data using the most rigorous procedures available, the studies of the present thesis harbor a few statistical shortcomings. First, it is necessary to note that a posteriori modifications were performed on the models of Studies 1 and 3. The results of Study 1 were successfully cross-validated in Study 2. Yet, it remains necessary to replicate the longitudinal results of Study 3 to exclude more confidently the eventuality that these results originated from sample-specific fluctuations in the data. In addition, although the longitudinal data gathered in Study 3 was analyzed using a leading edge

procedure, namely the structural modeling of the base-free measurement of change (Raykov, 1992a, 1992b, 1993), future studies could attempt to further refine the analysis of long-term effects pertaining to the interest and motivation self-regulation model. For instance, in Study 3, only two waves of data were collected. Future studies could be conducted, using longitudinal panel designs comprising several testing waves, to better investigate the intraindividual trends in the self-regulation of interest and motivation. Provided that a sufficient number of participants is tested, it would be most interesting to analyze the results of such studies by testing growth curve structural models (e.g., McArdle & Epstein, 1987; Meredith & Tisak, 1990; Muthén, 1991; Willett, & Sayer, 1994).

Theoretical Limitations

From a theoretical point of view, it was hypothesized in the present thesis that causality flows from interest-enhancing strategies to interest, and from interest to self-determination. However, this initiative does not rest on the guidance provided by the theoretical works of Sansone (1992), Deci (1985, 1991), and their colleagues. No clear causal sequence could be derived from the interest and motivation self-regulation model (Sansone et al., 1992), nor from self-determination theory (Deci & Ryan, 1985, 1991). In the model proposed by Sansone and her colleagues (1992), interest and motivation are hardly differentiated. It is not possible to determine which construct is surmised to precede the other. As previously mentioned, it is also unclear whether interest is considered an antecedent or a consequence of self-determination (Deci, 1992). Thus, in the absence of theoretical guidelines, the model proposed in the present study reflects the intuitive preference of the author. The results offered modest yet robust support for this causal sequence. Yet, the eventuality of reciprocal causation remains to be evaluated on independent samples. People possessing higher self-determination could be inclined to use interest-enhancing strategies more frequently, and more frequent interest-

enhancing strategy use could predict greater interest. Such an eventuality could be investigated by testing a non-recursive causal model on longitudinal panel data from an independent sample.

Another limitation concerns our knowledge relative to the internalization of self-determination. The internalization of self-determination is theorized to be a developmental process (Deci & Ryan, 1985). The need for self-determination is postulated to be a dynamic force that expresses itself throughout our lives. Yet, there has been very few investigations pertaining to the internalization of self-determination (e.g., Beauchamp, Halliwell, Fournier, & Koestner, 1996; Chandler & Connell, 1987; Deci, Eghari, Patrick, & Leone, 1994). Longitudinal research on interest and motivation self-regulation could be helpful in substantiating the occurrence of this phenomenon. Thus, the role played by interest-enhancing strategies in interest and motivation self-regulation could be investigated from a developmental point of view in future studies. It would be particularly interesting to study children because childhood is said to be a very active period for the internalization of external demands (Deci & Ryan, 1985). In these studies, interest-enhancing strategy use, interest, and self-determination, towards a variety of boring tasks could be assessed repeatedly over a period of several years.

Finally, from a fundamental point of view, little is known from the origin of interest-enhancing strategy use. In Studies 1, 2, and 3, participants reported using all five interest-enhancing strategies to a moderate extent. Thus, young adults appear capable to spontaneously use these strategies. These results are in agreement with those of Sansone and colleagues (1992), which demonstrated that people possess implicit knowledge about interest-enhancing strategies and their possible uses. But how is this knowledge acquired? Is interest-enhancing strategy use an innate and spontaneous reaction to low levels of stimulation? Do people self-educate themselves through trial and error? Are interest-enhancing strategies learned from the social environment through conditioning or modeling? Longitudinal studies using children as

participants are necessary if we want to reach an understanding of the processes involved in the development of interest-enhancing strategy use.

In conclusion, albeit the consistent results within Studies 1, 2, 3, and 4, offer reasonable support for the revised interest and motivation self-regulation model, future studies could be performed to remedy to the psychometric, methodological, statistical, and theoretical limitations pertaining to these studies, to refine the present findings, and to further explore their validity. Alternatively, future studies could also attempt to expand on the results of the present thesis, and to broaden our understanding of the factors and processes involved in interest and motivation self-regulation. The following section presents possible directions for future research devised to develop the interest and motivation self-regulation model.

Future Research

Research on interest and motivation self-enhancement is in its infancy and several interesting research questions could be addressed in future investigations. In the context of the present thesis, significant and robust direct and indirect effects were detected between interest-enhancing strategy use and interest, and between interest and self-determination. Moreover, it was argued that, by joining the perspective of Sansone and her colleagues (1992), and Deci and Ryan (1985, 1991), plausible processes responsible for the internalization of self-determination and the evolution of motivation were identified. Having identified robust effects, and proposed mechanisms for their occurrence, future research pertaining to interest and motivation self-regulation could turn towards the exploration of moderating variables. Different examples of research endeavors focusing on moderating variables are proposed in the paragraphs below.

First, new research venues could focus on the interaction between particular individual qualities and interest-enhancing strategy use. For instance, divergent thinking, convergent thinking, and emotional intelligence could facilitate interest and motivation self-regulation. First, divergent thinking refers to creative problem solving, while convergent thinking pertains to factual problem solving (e.g., deductive logic, IQ tests; Getzels & Jackson, 1962; Hudson, 1966; Wakefield, 1987). Higher divergent thinking skills could contribute to a more creative and/or more frequent interest-enhancing strategy use, because it entails the ability to distance oneself from a problem in order to approach it in inventive ways. Alternatively, convergent thinking abilities could permit better interest and motivation self-regulation by facilitating attentional involvement. Second, emotional intelligence is defined as the ability to identify accurately and regulate effectively affective states in oneself and others (Salovey, Hsee, & Mayer, 1993; Salovey & Mayer, 1990). An awareness of boredom states and a natural ability to manipulate one's feelings could definitely be an asset in self-regulating interest and motivation. Personality traits such as the aptitude for divergent thinking, convergent thinking, and emotional intelligence could be assessed prior to an experimental procedure similar to Study 4. Groups of participants that are high and low on each personal characteristic could be assigned to each experimental strategies conditions. The main effect of personality characteristics on interest-enhancing strategy use, as well as the interaction between personality traits and interest-enhancing strategy use on interest and self-determination, could be investigated. The results are liable to further expand our understanding of personal influence in the development and evolution of interest and self-determination.

Second, the characteristics of the uninteresting task are also likely to moderate the relationships between interest-enhancing strategy use, interest, and self-determination. For instance, a strategy such as attentional involvement might be easier to implement when the task is relatively complex. Conversely, exploitation of stimulation could presumably be more

useful when the task is fairly easy. Some tasks provide more opportunities than others for challenge enhancement and introduction of variety as well. Tasks in which one's progress can be easily monitored could facilitate the use of challenge enhancement. Manual tasks and tasks that can be approached in different ways are likely to be more suited for introduction of variety. Personal meaningfulness is also likely to vary somewhat with respect to the context from which the task is borrowed. Using an experimental design similar to the design of Study 4, participants assigned to each of the six experimental groups could be exposed to a series of five tasks providing specific affordances for each of the five proposed interest-enhancing strategies. The main effect of task characteristic on interest-enhancing strategy use, and the interaction between task characteristic and interest-enhancing strategy use on interest and self-determination could be assessed. In applied settings such as sports, work, or education, the characteristics of various tasks could be rated by panels of experts and by research participants, and an attempt could be made to relate these characteristics to interest-enhancing strategies, interest, and motivation.

Third, interpersonal and intrapersonal interest and motivation self-regulation processes could be investigated jointly. For example, the effect of autonomy supportive and controlling interpersonal behaviors on self-determination have been extensively studied (e.g., Deci & Ryan, 1987). Autonomy supportive interpersonal behaviors respect the individual's need for self-determination by encouraging and respecting personal input and initiative. Conversely, controlling interpersonal behaviors occur when pressure and constraints are imposed. It has long been known that autonomy support has a beneficial impact on self-determination, while control has adverse consequences (see Deci and Ryan, 1985, 1991, for literature reviews). It would be very interesting to evaluate how autonomy supportive and controlling interpersonal styles affect interest-enhancing strategy use. Conceivably, the combination of high interest-enhancing strategy use and autonomy supportive interpersonal climate is liable to foster optimal

interest and self-determination. Conversely, the combination of low interest enhancing strategy use and controlling interpersonal environment is likely to seriously hinder interest and self-determination. Yet, it is hard to predict how interpersonal behaviors will impact on strategy use. Two hypotheses appear plausible at this point in time. Because autonomy support fosters self-regulation, it could encourage interest-enhancing strategy use, and control could dissuade it. Alternatively, given that autonomy support has a positive impact on interest and self-determination (Deci, 1992), maybe interest-enhancing strategy use becomes less necessary in an autonomy supportive climate. Using a similar argument, because controlling behaviors have a detrimental effect on interest and motivation, interest-enhancing strategy use may become all the more necessary in this kind of interpersonal climate. The aforementioned hypotheses could be tested in quasi-experimental or experimental designs, by manipulating the interpersonal climate and the use of interest-enhancing strategies.

Provided that the previous research endeavors are fruitful, it might become possible one day to integrate all the aforementioned moderators in a single model. The relative impact of intrapersonal, personal, situational, and interpersonal factors on the self-regulation of interest and motivation could then be compared.

Finally, as a complement to the study of moderating variables, the interest and motivation self-regulation model could be expanded to encompass motivational consequences. In Study 4, participants in the attentional involvement condition were less tired at the end of the experiment than the participants of the control group. Participants in the exploitation of stimulation condition also performed worse than the participants in the control group. These exploratory findings suggest that different interest-enhancing strategies possibly entail diverse consequences. Using prior studies on self-determination as guidelines, future research could evaluate psychological consequences related to interest-enhancing strategy use, such as self-esteem, perceived locus of control, depressive mood, and life satisfaction (e.g., Pelletier et al.,

1995, 1997). Behavioral consequences, such as performance and persistence, could also be assessed (e.g., Green-Demers et al., 1992; Vallerand & Bissonnette, 1992). These studies could be performed, using correlational or quasi-experimental designs, in a wide variety of life domains (e.g., sports, work, housework, pro-environmental activities, etc.).

Conclusion

Boredom and lack of motivation are aversive and counter-productive experiences. Fortunately, studies in the area of interest and motivation self-regulation suggest that it might be possible to transcend boredom and enhance motivation. On the foundation of the works of Sansone (1992), Deci (1985, 1991), and their colleagues, the goal of the present thesis was to build and test a model of interest and motivation self-regulation. It was argued in the context of the present thesis that the theoretical perspectives of Sansone and her colleagues (1992), and Deci and Ryan (1985, 1991) complement each other nicely, and that their joint investigation is likely to expand our knowledge of interest and motivation self-regulation. The main contributions of the interest and motivation self-regulation model proposed in the present thesis are twofold. Self-determination theory supplements the interest and motivation enhancement model proposed by Sansone and her colleagues (1992) by providing theoretical premises regarding the nature of motivation and the stages of its evolution. In turn, the interest and motivation enhancement model (Sansone et al., 1992) enriches self-determination theory (Deci & Ryan, 1985). According to self-determination theory, motivation is a dynamic phenomenon. People are active agents driven to internalize the regulation of their behavior. Yet, the intrapersonal processes permitting the internalization of behavioral regulation appeared to have been, by and large, disregarded. Interest-enhancing strategy use could constitute a process by which people heighten their self-determination, thus internalizing the regulation of

their behavior. Although more research is undoubtedly necessary to further investigate the validity of the present findings, these findings provided preliminary support for the proposed interest and motivation self-regulation model. These results offer a basis for future studies pertaining to the intrapersonal processes of interest and motivation self-regulation. Past research primarily focused on the influence of the social and contextual factors liable to alter interest and motivation. Higher interest and motivation levels have been related to a host of positive consequences such as greater perceived competence, freedom, positive emotions, and longer persistence in the pursuit of the target activity. It is our hope that the study of interest and motivation self-regulation will contribute to yield insightful knowledge regarding the processes by which individuals can bring such desirable outcomes on themselves.

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APPENDIX A

Questionnaire Used in Study 1

Instructions for Completing the Questionnaire Package

A study is presently being conducted at the University of Ottawa under the direction of Dr. Luc Pelletier, School of Psychology. We are interested in understanding the means by which people cope when they are faced with a boring task they cannot avoid. We would be very pleased to have your participation in this research.

Participation in this research project is completely voluntary. The decision to participate, or not, is yours. Your answers to these questionnaires are completely anonymous and confidential. Nowhere in the package will you be asked to give your name, so your identity will remain unknown. Also, no one, including your professor, will have access to your responses.

Your participation will involve answering this questionnaire package. Completing the questionnaires will probably not take you more than 20 minutes. When answering the items, we ask that you try to answer them as honestly and accurately as possible. This is not a test. It is important to remember that there are no right or wrong answers; we are simply interested in your honest opinions. Also, we encourage you not to leave any items unanswered, but instead pick the response that best describes your thoughts and feelings for the item. Of course, you are not obligated to answer any question to which you do not feel comfortable responding to, and you are free to withdraw from the study at any point in time. If you have any questions, please contact us at (613) 564-7116.

We would like to extend our appreciation for your co-operation in this research project.

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Indicate the title of the course in which this questionnaire is completed: _____

Please refer to this particular course while answering the questions throughout the questionnaire.

WHY DO YOU ATTEND THIS COURSE?

On a scale from 1 to 9, please indicate to what extent each of the following items presently corresponds to one of the reasons why you attend this course.

	<u>Does not</u> <u>Correspond at all</u>			<u>Corresponds</u> <u>Moderately</u>			<u>Corresponds</u> <u>Exactly</u>		
1. Because I experience pleasure and satisfaction while learning new things.	1	2	3	4	5	6	7	8	9
2. Because it is compulsory in my program.	1	2	3	4	5	6	7	8	9
3. To show to myself that I can succeed in this field.	1	2	3	4	5	6	7	8	9
4. Because it's one of the ways that I have chosen to acquire skills in an area which is important to me.	1	2	3	4	5	6	7	8	9
5. Because this course provides me with a better understanding of the profession which will be mine.	1	2	3	4	5	6	7	8	9
6. I wonder what I'm doing in this course; actually, I find it boring.	1	2	3	4	5	6	7	8	9
7. For the pleasure I experience while surpassing myself in my studies.	1	2	3	4	5	6	7	8	9
8. For the intense feeling I experience when I am communicating my own ideas to others.	1	2	3	4	5	6	7	8	9
9. Honestly I don't know, I truly have the impression of wasting my time in this course.	1	2	3	4	5	6	7	8	9
10. Because taking a course in this field makes me feel important.	1	2	3	4	5	6	7	8	9
11. Because it allows me to learn about subjects which are of utmost importance to me.	1	2	3	4	5	6	7	8	9
12. Because this course allows me to continue to learn about a lot of things that interest me.	1	2	3	4	5	6	7	8	9
13. Because I need the credits for my degree.	1	2	3	4	5	6	7	8	9
14. For the satisfaction I experience when I am in the process of achieving difficult academic activities.	1	2	3	4	5	6	7	8	9
15. Because, in my opinion, it is a good way to develop skills which will be useful to me later.	1	2	3	4	5	6	7	8	9
16. For the pleasure that I experience when I read interesting authors.	1	2	3	4	5	6	7	8	9
17. I don't know, I can't understand what I am doing in this course.	1	2	3	4	5	6	7	8	9

18. For the pleasure I experience when I discover new things never seen before.	1	2	3	4	5	6	7	8	9
19. Because it is a prerequisite for other courses I want to take.	1	2	3	4	5	6	7	8	9
20. For the pleasure that I experience while I am surpassing myself in one of my personal accomplishments.	1	2	3	4	5	6	7	8	9
21. For the pleasure that I experience when I feel completely absorbed by what certain authors have written.	1	2	3	4	5	6	7	8	9
22. To show to myself that I am an intelligent person.	1	2	3	4	5	6	7	8	9
23. For the pleasure that I experience in knowing more about subjects which appeal to me.	1	2	3	4	5	6	7	8	9
24. Because knowledge in this field is very meaningful to me.	1	2	3	4	5	6	7	8	9
25. Because university allows me to experience a personal satisfaction in my quest for excellence in my studies.	1	2	3	4	5	6	7	8	9
26. Because it is one of the ways I have chosen to take responsibility for my future career.	1	2	3	4	5	6	7	8	9
27. I once had good reasons for registering in this course; however, now I wonder whether I should continue.	1	2	3	4	5	6	7	8	9
28. Because it was one of the only courses which fit in my schedule.	1	2	3	4	5	6	7	8	9
29. To prove to myself that I am adept in this field.	1	2	3	4	5	6	7	8	9
30. Because taking this course is a good way to prepare myself for my future studies.	1	2	3	4	5	6	7	8	9
31. Because taking courses in this field is what I really want to do for the time being.	1	2	3	4	5	6	7	8	9
32. For the "high" feeling that I experience while reading on various interesting subjects.	1	2	3	4	5	6	7	8	9

INTEREST IN ACADEMIC TASKS

On a scale from 1 to 9, please indicate how interesting you generally find the following academic tasks.

	<u>Not interesting</u> <u>at all</u>			<u>Moderately</u> <u>interesting</u>			<u>Totally</u> <u>interesting</u>		
1. Writing exams	1	2	3	4	5	6	7	8	9
2. Routine studying	1	2	3	4	5	6	7	8	9
3. Studying for exams	1	2	3	4	5	6	7	8	9

COPING WITH LESS INTERESTING TASKS

*The following statements refer to strategies people are likely to use , or attitudes they are likely to adopt , in order to make their lives easier when they are faced with a task they find less interesting. Using the 1 to 9 scale below, could you please indicate how frequently you generally use these strategies **WHEN YOU PERFORM THE TASKS IDENTIFIED ABOVE.***

	<u>Never</u>			<u>Half</u> <u>of the time</u>			<u>Always</u>		
1. I set time limits in order to challenge myself.	1	2	3	4	5	6	7	8	9
2. I alternate the less interesting material/task with those that are more interesting.	1	2	3	4	5	6	7	8	9
3. I like to eat while I perform the task.	1	2	3	4	5	6	7	8	9
4. I try to find the purpose of the task in order to make it more appealing.	1	2	3	4	5	6	7	8	9
5. I set the challenge to accomplish a certain amount of work in a certain time period.	1	2	3	4	5	6	7	8	9
6. I try to immerse myself in the task.	1	2	3	4	5	6	7	8	9
7. I approach the different parts of the task by using a variety of methods.	1	2	3	4	5	6	7	8	9
8. I do different parts of the task at different times.	1	2	3	4	5	6	7	8	9
9. I like to drink stimulants (tea, coffee) while I perform the task.	1	2	3	4	5	6	7	8	9
10. I trick myself into believing that performing the task is actually more interesting, when completion of the task is important to me.	1	2	3	4	5	6	7	8	9
11. I like to drink pop, milk, juice, etc. while I perform the task.	1	2	3	4	5	6	7	8	9
12. I set task specific goals for myself.	1	2	3	4	5	6	7	8	9
13. I think of personal reasons to perform the activity.	1	2	3	4	5	6	7	8	9
14. I concentrate on what I'm doing at the moment.	1	2	3	4	5	6	7	8	9
15. I keep my mind focused on each step of the process of accomplishing the task.	1	2	3	4	5	6	7	8	9

.....
(See next page)

BACKGROUND INFORMATION

1. Gender : Male _____ Female _____
 2. Mother tongue: French _____ English _____ Other (please specify): _____
 3. Citizenship: Canadian _____ Other (please specify) _____
 4. I am presently in my first ____ second ____ third ____ fourth ____ or other ____ year of university.
 5. I am a full time student: yes _____ no _____
 6. What is your major (or intended major)? _____
 7. My grade point average so far in school is: _____
 8. My grade point average for this term should be around: _____
-

***THANK YOU VERY MUCH FOR YOUR TIME ; IT IS GREATLY
APPRECIATED!***

APPENDIX B

Covariance Matrix for the Indicators of the Interest and Motivation

Self-Regulation Model (Study 1)

COVARIANCE MATRIX TO BE ANALYZED

	ATT1	ATT2	ATT3	INT1	INT2	INT3
	-----	-----	-----	-----	-----	-----
ATT1	4.64					
ATT2	2.04	3.54				
ATT3	2.24	2.02	4.18			
INT1	1.34	1.05	1.19	5.42		
INT2	.91	.88	.89	2.17	4.06	
INT3	1.18	1.01	1.02	3.87	3.06	5.34
SDIA1	1.39	1.24	1.23	1.46	1.48	1.70
SDIA2	1.53	1.17	1.39	1.80	1.60	1.96
SDIA3	1.31	1.15	1.15	1.69	1.62	1.75
SDIA4	1.38	.79	.78	1.22	.95	1.05
VAR1	.96	.70	1.15	.56	1.06	.83
VAR2	1.78	1.00	1.66	.87	1.35	1.20
VAR3	.66	.05	.65	.10	.39	-.06
CH1	1.56	.55	1.56	.81	.84	.95
CH2	1.80	1.03	1.68	.48	.75	.78
CH3	2.10	1.26	2.49	.85	1.12	1.08
RAT1	1.86	1.03	2.03	1.05	1.29	1.40
RAT2	1.14	.89	1.17	.36	.30	.53
RAT3	1.12	1.12	1.01	.40	.30	.62
STIM1	-.03	-.36	-.67	-.63	-.30	-.52
STIM2	.54	.22	-.34	-.26	-.09	.14
STIM3	-.21	-.41	-.93	-.55	-.34	-.48

COVARIANCE MATRIX TO BE ANALYZED Cont'd

	SDIA1	SDIA2	SDIA3	SDIA4	VAR1	VAR2
	-----	-----	-----	-----	-----	-----
SDIA1	7.48					
SDIA2	5.72	7.08				
SDIA3	4.83	5.11	6.29			
SDIA4	4.21	4.07	3.78	6.19		
VAR1	.64	1.05	1.08	.76	4.42	
VAR2	.81	.67	.73	.37	1.28	4.05
VAR3	.21	.11	.07	.67	1.33	1.17
CH1	.84	.83	.93	.59	1.93	1.63
CH2	.70	.42	.82	1.00	1.49	1.88
CH3	1.07	.98	1.36	1.01	1.65	1.94
RAT1	1.06	1.05	.80	.61	1.03	2.22
RAT2	.69	.33	.52	.72	.23	1.35
RAT3	.66	.45	.46	.38	.39	1.12
STIM1	-.03	-.09	-.27	.31	-.04	.13
STIM2	.34	.33	.16	.31	-.19	.18
STIM3	-.32	-.65	-.28	.35	-.07	-.09

COVARIANCE MATRIX TO BE ANALYZED Cont'd

	VAR3	CH1	CH2	CH3	RAT1	RAT2
	-----	-----	-----	-----	-----	-----
VAR3	4.08					
CH1	1.40	5.79				
CH2	1.89	3.17	5.71			
CH3	1.38	2.42	3.18	5.39		
RAT1	1.07	1.41	1.64	2.16	5.21	
RAT2	.82	.91	1.19	1.47	1.95	5.33
RAT3	.87	.57	1.08	1.24	2.18	2.21
STIM1	.65	-.12	.41	-.16	.18	.86
STIM2	-.23	-.98	-.57	.05	.79	.87
STIM3	.31	-.64	.10	.06	.25	1.03

COVARIANCE MATRIX TO BE ANALYZED Cont'd

	RAT3	STIM1	STIM2	STIM3
	-----	-----	-----	-----
RAT3	5.07			
STIM1	.70	5.34		
STIM2	-.01	1.06	8.39	
STIM3	.53	2.85	1.87	7.21

APPENDIX C

Questionnaire Used in Study 2

Instructions for Completing the Questionnaire Package

A study is presently being conducted at the University of Ottawa, under the direction of Dr. Luc Pelletier, School of Psychology. We are interested in understanding the means by which people cope when they are faced with a boring task they cannot avoid. We would be very pleased to have your participation in this research.

Participation in this research project is completely voluntary. The decision to participate, or not, is yours. Your answers to these questionnaires are completely anonymous and confidential. Nowhere in the package will you be asked to give your name, so your identity will remain unknown. Also, no one, including your professor, will have access to your responses.

Your participation will involve answering this questionnaire package. Completing the questionnaires will take approximately 20 minutes. Please answer the items as honestly and accurately as possible. This is not a test. It is important to remember that there are no right or wrong answers; we are simply interested in your honest opinions. Also, we encourage you not to leave any items unanswered, but instead pick the response that best describes your thoughts and feelings for the item. Of course, you are not obligated to answer any question to which you do not feel comfortable in responding to, and you are free to withdraw from the study at any point in time. If you have any questions, please contact us at (613) 564-7116.

We would like to extend our appreciation for your co-operation in this research project.

Isabelle Green-Demers & Luc Pelletier, Ph.D.
School of Psychology
University of Ottawa
125, Jean-Jacques Lussier
K1N 6N5

Indicate the title of the course in which this questionnaire is completed: _____

Please refer to this particular course while answering the questions throughout the questionnaire.

WHY DO YOU ATTEND THIS COURSE?

On a scale from 1 to 9 please indicate to what extent each of the following items presently corresponds to one of the reasons why you attend this course.

	<u>Does not</u> <u>Correspond at all</u>			<u>Corresponds</u> <u>Moderately</u>			<u>Corresponds</u> <u>Exactly</u>		
1. Because I experience pleasure and satisfaction while learning new things.	1	2	3	4	5	6	7	8	9
2. Because it is compulsory in my program.	1	2	3	4	5	6	7	8	9
3. To show to myself that I can succeed in this field.	1	2	3	4	5	6	7	8	9
4. Because it's one of the ways that I have chosen to acquire skills in an area which is important to me.	1	2	3	4	5	6	7	8	9
5. Because this course provides me with a better understanding of the profession which will be mine.	1	2	3	4	5	6	7	8	9
6. I wonder what I'm doing in this course; actually, I find it boring.	1	2	3	4	5	6	7	8	9
7. For the pleasure I experience while surpassing myself in my studies.	1	2	3	4	5	6	7	8	9
8. For the intense feeling I experience when I am communicating my own ideas to others.	1	2	3	4	5	6	7	8	9
9. Honestly I don't know, I truly have the impression of wasting my time in this course.	1	2	3	4	5	6	7	8	9
10. Because taking a course in this field makes me feel important.	1	2	3	4	5	6	7	8	9
11. Because it allows me to learn about subjects which are of utmost importance to me.	1	2	3	4	5	6	7	8	9
12. Because this course allows me to continue to learn about a lot of things that interest me.	1	2	3	4	5	6	7	8	9
13. Because I need the credits for my degree.	1	2	3	4	5	6	7	8	9
14. For the satisfaction I experience when I am in the process of achieving difficult academic activities.	1	2	3	4	5	6	7	8	9

15. Because in my opinion, it is a good way to develop skills which will be useful to me later.	1	2	3	4	5	6	7	8	9
16. For the pleasure that I experience when I read interesting authors.	1	2	3	4	5	6	7	8	9
17. I don't know, I can't understand what I am doing in this course.	1	2	3	4	5	6	7	8	9
18. For the pleasure I experience when I discover new things never seen before.	1	2	3	4	5	6	7	8	9
19. Because it is a prerequisite for other courses I want to take.	1	2	3	4	5	6	7	8	9
20. For the pleasure that I experience while I am surpassing myself in one of my personal accomplishments.	1	2	3	4	5	6	7	8	9
21. For the pleasure that I experience when I feel completely absorbed by what certain authors have written.	1	2	3	4	5	6	7	8	9
22. To show to myself that I am an intelligent person.	1	2	3	4	5	6	7	8	9
23. For the pleasure that I experience in knowing more about subjects which appeal to me.	1	2	3	4	5	6	7	8	9
24. Because knowledge in this field is very meaningful to me.	1	2	3	4	5	6	7	8	9
25. Because university allows me to experience a personal satisfaction in my quest for excellence in my studies.	1	2	3	4	5	6	7	8	9
26. Because it is one of the ways I have chosen to take responsibility for my future career.	1	2	3	4	5	6	7	8	9
27. I once had good reasons for registering in this course; however, now I wonder whether I should continue.	1	2	3	4	5	6	7	8	9
28. Because it was one of the only courses which fit in my schedule.	1	2	3	4	5	6	7	8	9
29. To prove to myself that I am adept in this field.	1	2	3	4	5	6	7	8	9
30. Because taking this course is a good way to prepare myself for my future studies.	1	2	3	4	5	6	7	8	9
31. Because taking courses in this field is what I really want to do for the time being.	1	2	3	4	5	6	7	8	9
32. For the "high" feeling that I experience while reading on various interesting subjects.	1	2	3	4	5	6	7	8	9

I. INTEREST IN ACADEMIC TASKS: - ROUTINE (DAILY) STUDYING

Using the 1-9 scale below, indicate the extent of your agreement by circling the appropriate number to the right of each item.

	<u>Not at all</u>			<u>Moderately</u>			<u>Extremely</u>		
1. How interesting do you generally find routine studying in this course.	1	2	3	4	5	6	7	8	9
2. How novel is the material you cover when you do routine studying in this course?	1	2	3	4	5	6	7	8	9
3. Is there a lot of variety in the material you cover when you do routine studying for this course?	1	2	3	4	5	6	7	8	9
4. How curious do you feel towards the material you cover when you do daily studying in this course?	1	2	3	4	5	6	7	8	9

COPING WHEN DOING ROUTINE STUDYING FOR THIS COURSE

The following statements refer to strategies people are likely to use , or attitudes they are likely to adopt , in order to make their lives easier when they do routine studying. Using the 1 to 9 scale below, could you please indicate how frequently you generally use these strategies.

	<u>Never</u>			<u>Half of the time</u>			<u>Always</u>		
1. I set time limits in order to challenge myself.	1	2	3	4	5	6	7	8	9
2. I alternate the less interesting material/task with those that are more interesting.	1	2	3	4	5	6	7	8	9
3. I like to eat while I perform the task.	1	2	3	4	5	6	7	8	9
4. I try to find the purpose of the task in order to make it more appealing.	1	2	3	4	5	6	7	8	9
5. I set the challenge to accomplish a certain amount of work in a certain time period.	1	2	3	4	5	6	7	8	9
6. I try to immerse myself in the task.	1	2	3	4	5	6	7	8	9
7. I approach the different parts of the task by using a variety of methods.	1	2	3	4	5	6	7	8	9
8. I do different parts of the task at different times.	1	2	3	4	5	6	7	8	9
9. I like to drink stimulants (tea, coffee) while I perform the task.	1	2	3	4	5	6	7	8	9
10. I trick myself into believing that performing the task is actually more interesting, when completion of the task is important to me.	1	2	3	4	5	6	7	8	9
11. I like to drink pop, milk, juice, etc. while I perform the task.	1	2	3	4	5	6	7	8	9
12. I set task specific goals for myself.	1	2	3	4	5	6	7	8	9
13. I think of personal reasons to perform the activity.	1	2	3	4	5	6	7	8	9

	<u>Never</u>			<u>Half of the time</u>			<u>Always</u>		
14. I concentrate on what I'm doing at the moment.	1	2	3	4	5	6	7	8	9
15. I keep my mind focused on each step of the process of accomplishing the task.	1	2	3	4	5	6	7	8	9

BACKGROUND INFORMATION

1. Gender : Male _____ Female _____
 2. Age: _____
 3. Mother tongue: French _____ English _____ Other (please specify): _____
 4. Citizenship: Canadian _____ Other (please specify) _____
 5. I am presently in my first ____ second ____ third ____ fourth ____ or other ____ year of university.
 6. My grade point average so far in school is: _____
 7. My grade point average for this term should be around: _____
 8. My final mark for this course should be around: _____
-

**THANK YOU VERY MUCH FOR YOUR TIME ; IT IS GREATLY
APPRECIATED!**

APPENDIX D

Covariance Matrix for the Indicators of the Interest and Motivation

Self-Regulation Model (Study 2)

COVARIANCE MATRIX TO BE ANALYZED

	ATT1	ATT2	ATT3	INT1	INT2	INT3
	-----	-----	-----	-----	-----	-----
ATT1	4.00					
ATT2	1.49	3.03				
ATT3	1.54	1.86	3.87			
INT1	.86	.94	1.03	2.92		
INT2	.83	.32	.57	.46	2.83	
INT3	.75	.47	.56	.49	1.29	3.20
INT4	1.24	.61	.88	1.05	1.44	1.91
SDIA1	.84	.24	.28	.58	.77	.57
SDIA2	1.06	.59	.52	.98	.91	.95
SDIA3	.88	.55	.55	.75	.69	.91
SDIA4	1.04	.75	.76	.66	.94	.93
CH1	1.22	.50	1.10	.65	.36	.41
CH2	1.33	.54	1.48	.38	.26	.35
CH3	1.38	.98	1.65	1.04	.61	.51
RAT1	1.15	1.01	1.56	1.07	.69	.33
RAT2	1.33	.47	1.32	.49	.48	.02
RAT3	1.11	.74	1.28	.39	.11	.05
STIM1	-.03	-.26	-.21	-.60	-.15	-.49
STIM2	.74	.55	.69	.10	.35	.06
STIM3	.16	.44	.29	.21	-.16	-.25
VAR1	.68	.12	.74	.66	-.05	-.05
VAR2	1.44	.91	1.33	.91	.50	.26
VAR3	.23	.02	.25	-.13	.20	.14

COVARIANCE MATRIX TO BE ANALYZED Cont'd

	INT4	SDIA1	SDIA2	SDIA3	SDIA4	CH1
	-----	-----	-----	-----	-----	-----
INT4	3.76					
SDIA1	1.93	6.13				
SDIA2	2.39	4.58	5.64			
SDIA3	2.04	3.74	3.93	4.56		
SDIA4	2.03	3.95	3.95	3.57	6.59	
CH1	1.03	.67	.84	.73	.65	5.13
CH2	.60	.31	.30	.38	.31	2.79
CH3	.95	.90	.92	.84	1.06	2.36
RAT1	.81	.45	.79	.79	.66	.93
RAT2	.81	.32	.47	.30	.14	1.39
RAT3	.53	.54	.69	.63	.69	1.11
STIM1	-.32	-.13	-.43	.02	-.37	.18
STIM2	.57	.25	.40	.41	.23	.32
STIM3	-.23	-.18	-.04	.10	-.58	.47
VAR1	.35	.39	.37	.56	.33	1.85
VAR2	.65	.25	.39	.25	.02	1.24
VAR3	.31	.01	.00	.36	.03	.43

COVARIANCE MATRIX TO BE ANALYZED Cont'd

	CH2	CH3	RAT1	RAT2	RAT3	STIM1
	-----	-----	-----	-----	-----	-----
CH2	5.07					
CH3	2.48	5.10				
RAT1	.99	1.24	4.69			
RAT2	1.29	1.56	1.60	5.91		
RAT3	1.08	1.73	1.75	2.22	5.00	
STIM1	.37	-.08	.36	.67	.57	6.51
STIM2	.75	.47	.81	.91	.69	1.44
STIM3	.76	.89	.57	1.10	.91	3.38
VAR1	1.29	1.36	.66	.96	.86	.36
VAR2	1.08	1.42	1.41	1.48	1.00	.69
VAR3	.30	.59	.05	.88	.47	.78

COVARIANCE MATRIX TO BE ANALYZED Cont'd

	STIM2	STIM3	VAR1	VAR2	VAR3
	-----	-----	-----	-----	-----
STIM2	8.30				
STIM3	2.57	7.60			
VAR1	.39	.80	5.81		
VAR2	.55	.90	1.10	4.37	
VAR3	.46	.77	.79	.74	4.18

APPENDIX E

Questionnaire Used in Study 3

ACADEMIC MOTIVATION AND INTEREST SURVEY

Instructions for Completing the Questionnaire Package

A study is presently being conducted at the University of Ottawa, under the direction of Dr. Luc Pelletier, School of Psychology. We are interested in understanding the means by which people cope when they are faced with a boring task they cannot avoid. We would be very pleased to have your participation in this research.

Participation in this research project is completely voluntary. The decision to participate, or not, is yours. Your answers to these questionnaires are completely anonymous and confidential. Nowhere in the package will you be asked to give your name, so your identity will remain unknown. Also, no one, including your professor, will have access to your responses.

Your participation will involve answering this questionnaire package twice during the academic year 1994-95. The first testing session will take place in September 1994 and the second testing session will take place approximately 10 weeks later. Completing the questionnaires will take approximately 20 minutes. Please answer the items as honestly and accurately as possible. This is not a test. It is important to remember that there are no right or wrong answers; we are simply interested in your honest opinions. Also, we encourage you not to leave any items unanswered, but instead pick the response that best describes your thoughts and feelings for the item. Of course, you are not obligated to answer any question to which you do not feel comfortable in responding to, and you are free to withdraw from the study at any point in time. If you have any questions, please contact us at (613) 564-7116.

We would like to extend our appreciation for your co-operation in this research project.

Isabelle Green-Demers & Luc Pelletier, Ph.D.
School of Psychology
University of Ottawa
125, Jean-Jacques Lussier
K1N 6N5

Date of birth: _____

Last four digits of phone number: _____

Indicate the title of the course in which this questionnaire is completed: _____

Please consider the following questions as referring to the course you're presently in.**WHY DO YOU ATTEND THIS COURSE?***On a scale from 1 to 9 please indicate to what extent each of the following items presently corresponds to one of the reasons why you attend this course.*

	<u>Does not</u> <u>Correspond at all</u>			<u>Corresponds</u> <u>Moderately</u>			<u>Corresponds</u> <u>Exactly</u>		
1. Because I experience pleasure and satisfaction while learning new things.	1	2	3	4	5	6	7	8	9
2. Because it is compulsory in my program.	1	2	3	4	5	6	7	8	9
3. To show to myself that I can succeed in this field.	1	2	3	4	5	6	7	8	9
4. Because taking this course seems like a good way to prepare myself for future courses in my field.	1	2	3	4	5	6	7	8	9
5. Because my interest in this field is a part of who I am.	1	2	3	4	5	6	7	8	9
6. I wonder what I'm doing in this course; actually, I find it boring.	1	2	3	4	5	6	7	8	9
7. To prove to myself that I am smart enough to cut it in this field.	1	2	3	4	5	6	7	8	9
8. Because it looks good for someone in my field to take a course like this one.	1	2	3	4	5	6	7	8	9
9. Honestly I don't know, I truly have the impression I'm wasting my time in this course.	1	2	3	4	5	6	7	8	9
10. To prove to myself that I am apt to pursue a career in this field.	1	2	3	4	5	6	7	8	9
11. Because it allows me to learn about subjects which are of utmost importance to me.	1	2	3	4	5	6	7	8	9
12. Because this course allows me to continue to learn about a lot of things that interest me.	1	2	3	4	5	6	7	8	9
13. Because I need the credits for my degree.	1	2	3	4	5	6	7	8	9
14. Because I want this course to appear on my transcript.	1	2	3	4	5	6	7	8	9
15. Because in my opinion, it is a good way to develop skills which will be useful to me later.	1	2	3	4	5	6	7	8	9

	<u>Does not</u> <u>Correspond at all</u>			<u>Corresponds</u> <u>Moderately</u>			<u>Corresponds</u> <u>Exactly</u>		
16. I don't know, I can't understand what I am doing in this course.	1	2	3	4	5	6	7	8	9
17. Because it is a prerequisite for other courses I want to take.	1	2	3	4	5	6	7	8	9
18. To show myself that I am an intelligent person.	1	2	3	4	5	6	7	8	9
19. For the pleasure that I experience in knowing more about subjects which appeal to me.	1	2	3	4	5	6	7	8	9
20. Because taking this course at heart is an expression of who I am.	1	2	3	4	5	6	7	8	9
21. Because it is one of the ways I have chosen to take responsibility for my future career.	1	2	3	4	5	6	7	8	9
22. I once had good reasons for registering in this course; however, now I wonder whether I should continue.	1	2	3	4	5	6	7	8	9
23. For the pleasure I experience when I discover new things I've never seen before.	1	2	3	4	5	6	7	8	9
24. To prove to myself that I am adept in this field.	1	2	3	4	5	6	7	8	9
25. Because taking this course is a good way to prepare myself for my future studies.	1	2	3	4	5	6	7	8	9
26. Because taking a course in this field is part of the way I choose to live my life.	1	2	3	4	5	6	7	8	9

INTEREST IN ACADEMIC TASKS: ROUTINE (DAILY) STUDYING

Using the 1-9 scale below, indicate the extent of your agreement by circling the appropriate number to the right of each item.

	<u>Not at all</u>			<u>Moderately</u>			<u>Extremely</u>		
1. How interesting is routine studying in this course?	1	2	3	4	5	6	7	8	9
2. How boring is routine studying in this course?	1	2	3	4	5	6	7	8	9
3. How novel is the material you are faced with when you do routine studying in this course?	1	2	3	4	5	6	7	8	9
4. How monotonous is routine studying in this course?	1	2	3	4	5	6	7	8	9
5. Is there a lot of variety in the material you cover when you do routine studying in this course?	1	2	3	4	5	6	7	8	9
6. How curious do you feel towards the material you cover when you do routine studying in this course?	1	2	3	4	5	6	7	8	9

	<u>Not at all</u>			<u>Moderately</u>			<u>Extremely</u>		
7. How stimulating is routine studying in this course?	1	2	3	4	5	6	7	8	9
8. How tedious is routine studying in this course?	1	2	3	4	5	6	7	8	9

COPING WITH ROUTINE STUDYING IN THIS COURSE

The following statements refer to strategies people are likely to use , or attitudes they are likely to adopt , in order to make their lives easier when they do routine studying. Using the 1 to 9 scale below, could you please indicate how frequently you generally use these strategies.

	<u>Never</u>			<u>Half of the time</u>			<u>Always</u>		
1. I set time limits in order to challenge myself.	1	2	3	4	5	6	7	8	9
2. I alternate the less interesting material with material I find more interesting.	1	2	3	4	5	6	7	8	9
4. I like to eat while I perform the task.	1	2	3	4	5	6	7	8	9
5. I try to find the purpose of the task in order to make it more appealing.	1	2	3	4	5	6	7	8	9
6. I set the challenge to accomplish a certain amount of work in a certain time period.	1	2	3	4	5	6	7	8	9
7. I try to immerse myself in the task.	1	2	3	4	5	6	7	8	9
8. I approach the different parts of the task by using a variety of methods.	1	2	3	4	5	6	7	8	9
9. I do different parts of the task at different times.	1	2	3	4	5	6	7	8	9
10. I like to drink stimulants (tea, coffee, etc.) while I perform the task.	1	2	3	4	5	6	7	8	9
11. I trick myself into believing that performing the task is actually more interesting, when completion of the task is important to me.	1	2	3	4	5	6	7	8	9
12. I like to drink pop, milk, juice, etc. while I perform the task.	1	2	3	4	5	6	7	8	9
13. I set task specific goals for myself.	1	2	3	4	5	6	7	8	9
14. I think of personal reasons to perform the activity.	1	2	3	4	5	6	7	8	9
15. I concentrate on what I'm doing at the moment.	1	2	3	4	5	6	7	8	9
16. I keep my mind focused on each step of the process of accomplishing the task.	1	2	3	4	5	6	7	8	9
17. I alternate less-interesting tasks with one another.	1	2	3	4	5	6	7	8	9

	<u>Never</u>			<u>Half of the time</u>			<u>Always</u>		
19. I establish an ambitious work schedule and I challenge myself to stick to it.	1	2	3	4	5	6	7	8	9
20. I try to remind myself of reasons why the task is important to me.	1	2	3	4	5	6	7	8	9
23. I try to get totally wrapped up in what I'm doing.	1	2	3	4	5	6	7	8	9
25. I like to listen to music while I perform the task.	1	2	3	4	5	6	7	8	9

BACKGROUND INFORMATION

1. Gender : Male ☐ Female ☐
 2. Age: _____
 3. Mother tongue: French ☐ English ☐ Other ☐ Please specify: _____
 4. Citizenship: Canadian ☐ Other ☐ Please specify: _____
 5. Marital Status:
Single ☐ Married ☐ Common law ☐ Divorced ☐ Separated ☐
 6. Do you have children? No ☐ Yes ☐ How many? _____
 7. I am a full time student Yes ☐ No ☐
 8. I am presently in my first ☐ second ☐ third ☐ fourth ☐ or higher ☐ year of university
 9. My grade point average so far in school is: _____
 10. My grade point average for this term should be around: _____
 11. My final mark for this course should be around: _____
 12. What is your intended major? _____
 13. Is this course compulsory in your program? Yes ☐ No ☐
 14. Do you work full time? No ☐ Yes ☐
- If you work full time: How many years have you been in the job market? _____
- What is your profession? _____

THANK YOU VERY MUCH FOR YOUR TIME ; IT IS GREATLY APPRECIATED!

APPENDIX F

*Covariance Matrix for the Indicators of the Longitudinal Interest and
Motivation Self-Regulation Model (Study 3)*

COVARIANCE MATRIX TO BE ANALYZED

	CH1A	CH2A	CH3A	CH4A	RAT1A	RAT2A
CH1A	5.84					
CH2A	3.46	6.17				
CH3A	2.76	4.10	5.13			
CH4A	2.83	3.54	3.28	5.70		
RAT1A	1.22	1.27	1.21	1.27	5.41	
RAT2A	.74	1.27	1.39	1.25	1.73	5.06
RAT3A	1.11	1.48	1.45	1.86	1.87	3.12
RAT4A	1.02	1.46	1.63	1.98	1.47	2.47
ATT1A	.53	.99	1.12	1.25	-.07	.90
ATT2A	.91	1.12	1.37	1.58	.02	.89
ATT3A	.68	1.15	1.41	1.53	.07	.87
ATT4A	1.13	1.39	1.57	1.87	.73	.84
STIM1A	.41	.37	.07	.36	.76	-.03
STIM2A	.27	-.06	.08	.43	1.49	.40
STIM3A	.35	-.06	-.20	-.14	.46	.02
STIM4A	.04	-.28	-.35	-.62	.50	-.11
VAR1A	2.31	2.08	2.00	1.86	1.45	1.23
VAR2A	1.01	.81	.79	.94	.63	.86
VAR3A	.99	.94	1.15	.80	.85	1.21
VAR4A	1.61	1.54	1.80	2.00	1.27	1.28
INT1A	.61	.59	.72	.85	.61	.42
INT2A	.52	.64	.60	1.02	.29	.10
INT3A	.65	.77	.74	.71	.43	.63
INT4A	.41	.17	.24	.79	.16	-.07
INT1B	.52	.55	.54	.84	.29	.37
INT2B	.40	.57	.54	1.06	-.03	.21
INT3B	.63	.71	.66	.92	.46	.44
INT4B	.30	.29	.30	.77	.05	.24
SDIA1	.61	-.17	-.09	.23	.18	.78
SDIA2	.71	.03	.06	.61	.38	.70
SDIA3	.77	.26	.32	.80	.41	.95
SDIA4	.52	.58	.43	.81	.10	.86
SDIB1	.13	-.22	-.12	.01	-.10	.50
SDIB2	.87	.45	.28	.67	.29	.38
SDIB3	.52	.34	.21	.45	.05	.59
SDIB4	.39	.24	-.04	.31	-.02	.46

COVARIANCE MATRIX TO BE ANALYZED Cont'd

	RAT3A	RAT4A	ATT1A	ATT2A	ATT3A	ATT4A
	-----	-----	-----	-----	-----	-----
RAT3A	4.93					
RAT4A	3.08	4.41				
ATT1A	.68	1.10	3.24			
ATT2A	.68	1.15	2.60	3.53		
ATT3A	.97	1.57	2.29	2.37	3.19	
ATT4A	.92	1.46	2.08	2.24	2.54	4.24
STIM1A	.09	-.01	-.46	-.20	-.28	-.24
STIM2A	.82	.53	-.09	-.07	.20	.67
STIM3A	-.46	-.36	-.15	-.17	-.26	.06
STIM4A	-.12	-.84	-.75	-.33	-.57	-.90
VAR1A	1.22	1.22	.74	1.02	.90	1.02
VAR2A	1.02	.71	1.03	1.06	.81	.60
VAR3A	.81	.64	.24	.50	.30	.45
VAR4A	1.36	1.29	1.01	1.25	1.08	1.23
INT1A	.35	.68	.84	.95	.90	1.05
INT2A	.08	.47	.53	.87	.62	.90
INT3A	.29	.76	.72	.91	.82	.99
INT4A	-.05	.26	.50	.73	.64	.77
INT1B	.34	.67	.74	.80	.84	1.06
INT2B	.16	.65	.66	.78	.77	1.20
INT3B	.36	.76	.63	.79	.67	.94
INT4B	.05	.35	.60	.69	.64	.86
SDIA1	.34	.92	.33	.55	.25	.80
SDIA2	.57	.84	.65	.90	.56	1.12
SDIA3	.69	1.03	.52	.82	.44	.84
SDIA4	.77	.97	.64	.71	.55	.78
SDIB1	.30	.77	.40	.57	.16	.39
SDIB2	.38	.65	.60	.82	.53	.89
SDIB3	.42	.84	.66	.75	.48	.72
SDIB4	.51	.59	.52	.65	.39	.41

COVARIANCE MATRIX TO BE ANALYZED Cont'd

	STIM1A	STIM2A	STIM3A	STIM4A	VAR1A	VAR2A
	-----	-----	-----	-----	-----	-----
STIM1A	5.88					
STIM2A	1.48	7.19				
STIM3A	3.09	2.00	6.94			
STIM4A	1.80	.17	1.52	7.82		
VAR1A	.47	.53	.08	.10	5.83	
VAR2A	.81	-.05	-.04	.22	1.70	5.10
VAR3A	.85	.25	.61	.91	1.41	.73
VAR4A	.53	.76	.44	.58	3.63	1.85
INT1A	-.21	.43	.05	-.30	.98	.78
INT2A	-.30	.42	.02	-.20	.63	.63
INT3A	.05	.66	.04	-.26	.89	1.05
INT4A	-.33	.52	.01	-.64	.61	.66
INT1B	-.31	.08	-.24	-.86	.80	.55
INT2B	-.45	.06	-.41	-.77	.69	.49
INT3B	.00	.18	-.05	-.53	.77	.71
INT4B	-.64	.12	-.51	-.71	.57	.55
SDIA1	-.05	.39	.14	-.31	.57	.85
SDIA2	.28	.40	.39	-.35	.66	1.05
SDIA3	.00	.12	-.32	-.33	.89	.82
SDIA4	.06	.00	.21	-.45	.76	.73
SDIB1	-.29	-.16	.21	-.42	.43	.71
SDIB2	.06	.60	.38	-.51	.77	.88
SDIB3	-.13	.12	-.35	-.49	.64	.57
SDIB4	-.40	.11	-.36	-.47	.61	.72

COVARIANCE MATRIX TO BE ANALYZED Cont'd

	VAR3A	VAR4A	INT1A	INT2A	INT3A	INT4A
	-----	-----	-----	-----	-----	-----
VAR3A	4.77					
VAR4A	1.38	4.95				
INT1A	.37	.92	2.07			
INT2A	.18	.75	1.39	2.51		
INT3A	.38	.92	1.75	1.32	2.54	
INT4A	.01	.77	1.27	2.13	1.23	3.28
INT1B	.15	.64	1.06	.84	.98	.85
INT2B	.25	.67	1.17	1.46	1.17	1.45
INT3B	.33	.79	.82	.73	.98	.69
INT4B	.17	.63	.99	1.34	1.00	1.56
SDIA1	.55	.61	1.57	1.40	1.72	1.30
SDIA2	.83	.80	1.53	1.48	1.81	1.47
SDIA3	.63	.79	1.23	1.13	1.44	1.09
SDIA4	.66	.87	1.05	.80	1.13	.80
SDIB1	.31	.55	1.37	1.31	1.48	1.35
SDIB2	.36	.74	1.50	1.35	1.62	1.35
SDIB3	.25	.57	1.14	1.09	1.30	1.05
SDIB4	.24	.67	.98	.86	1.09	.87

COVARIANCE MATRIX TO BE ANALYZED Cont'd

	INT1B	INT2B	INT3B	INT4B	SDIA1	SDIA2
	-----	-----	-----	-----	-----	-----
INT1B	1.96					
INT2B	1.45	2.71				
INT3B	1.24	1.15	1.97			
INT4B	1.27	2.03	.98	2.75		
SDIA1	1.11	1.18	.87	.96	6.23	
SDIA2	1.19	1.36	1.09	1.06	4.46	5.06
SDIA3	.94	.99	.73	.82	3.50	3.12
SDIA4	.87	.88	.72	.75	2.78	2.56
SDIB1	1.21	1.33	1.16	1.40	4.17	3.64
SDIB2	1.35	1.40	1.25	1.48	3.40	3.39
SDIB3	1.14	1.31	1.11	1.21	2.89	2.64
SDIB4	1.00	1.02	.94	1.04	2.50	2.28

COVARIANCE MATRIX TO BE ANALYZED Cont'd

	SDIA3	SDIA4	SDIB1	SDIB2	SDIB3	SDIB4
	-----	-----	-----	-----	-----	-----
SDIA3	3.83					
SDIA4	2.24	3.03				
SDIB1	2.61	2.14	5.49			
SDIB2	2.49	1.99	3.95	4.47		
SDIB3	2.53	1.73	3.23	3.04	3.55	
SDIB4	2.00	1.77	2.97	2.60	2.32	3.25

APPENDIX G

Stimulus Materials: Trigrams and Meaningfulness Values (Study 4)

LIST 1

<u>Trigram</u>	<u>Meaningfulness</u>
BUJ	32
YIN	34
NUC	35
CAZ	36
CUW	38
GOC	39
MOF	40
KAG	41
BEQ	41
RIX	43
BEH	44
QAM	44
TOH	46
FUX	47
<i>Average</i>	40

LIST 2

<u>Trigram</u>	<u>Meaningfulness</u>
CEB	32
GAJ	33
FUQ	34
COQ	36
GYT	37
JOW	39
VIB	40
BYZ	41
LUQ	42
ZAN	43
SEQ	44
JOX	45
KEV	46
MUW	48
<i>Average</i>	40

LIST 3

<u>Trigram</u>	<u>Meaningfulness</u>
CEG	32
PYZ	33
KEC	34
JUW	35
MIJ	37
FEH	38
PIY	39
FOZ	41
PUH	42
HIB	44
TEP	45
WYM	45
SIQ	47
QAD	48
<i>Average</i>	40

LIST 4

<u>Trigram</u>	<u>Meaningfulness</u>
CYF	32
QAR	34
PIB	35
QER	36
SOZ	38
VYK	39
GOK	40
NEM	41
HEZ	41
FIP	42
QIS	44
HAQ	45
VOX	46
ZIN	47
<i>Average</i>	40

LIST 5

<u>Trigram</u>	<u>Meaningfulness</u>
CYV	32
TEB	35
QUZ	36
FEC	37
VYN	38
WOG	38
VAD	39
PAF	40
HIG	41
PUW	43
JOR	44
FAP	44
LIY	46
MYX	47
<i>Average</i>	40

LIST 6

<u>Trigram</u>	<u>Meaningfulness</u>
DIW	32
ZEM	33
COH	35
JAF	36
REZ	38
CYG	38
GIS	39
JYL	40
BEW	42
FUJ	43
MUY	45
YUH	45
LIX	46
VEP	48
<i>Average</i>	40

LIST 7

<u>Trigram</u>	<u>Meaningfulness</u>
NYF	33
DIH	34
QOT	34
BAJ	35
WUY	36
PUX	37
KEX	39
KYC	40
GOW	42
HIY	43
MOG	45
CYK	46
DUK	48
KIZ	48
<i>Average</i>	40

LIST 8

<u>Trigram</u>	<u>Meaningfulness</u>
FIK	32
TAH	34
KYP	37
ZAD	38
ZUT	38
REJ	39
TOZ	40
CEK	40
NIS	41
QYT	41
SYB	43
PIV	44
DYS	46
YAQ	47
<i>Average</i>	40

LIST 9

<u>Trigram</u>	<u>Meaningfulness</u>
GEK	32
ZYG	33
MOQ	35
SEH	36
NIR	38
BUQ	38
HUY	39
MYD	40
VAX	41
GUV	42
BEZ	44
QAC	47
LYX	47
GYL	48
<i>Average</i>	40

LIST 10

<u>Trigram</u>	<u>Meaningfulness</u>
SYQ	33
JOZ	34
GYF	34
ZOP	36
TEG	37
CYM	39
PAF	40
FUB	40
QAY	41
VAZ	42
WIV	43
NEP	46
TUD	47
QAL	48
<i>Average</i>	40

LIST 11

<u>Trigram</u>	<u>Meaningfulness</u>
JIW	32
MUP	34
ZOG	35
BOV	37
TUW	38
KAZ	39
RYL	40
JUK	40
SUY	41
YAN	43
PEQ	44
NID	44
YAT	46
SUG	47
<i>Average</i>	40

LIST 12

<u>Trigram</u>	<u>Meaningfulness</u>
TUQ	33
ZER	34
NIW	36
CUX	36
ZIL	37
LOQ	38
JEK	39
CIY	40
GOH	41
ZON	43
JYB	44
JOH	45
PEV	46
WUP	48
<i>Average</i>	40

LIST 13

<u>Trigram</u>	<u>Meaningfulness</u>
KOH	32
FEG	33
JUB	35
BUP	36
TEZ	38
QUT	39
DOY	39
BYF	41
TIQ	41
NEQ	42
RYC	44
MYG	45
RUC	47
PAJ	48
<i>Average</i>	40

LIST 14

<u>Trigram</u>	<u>Meaningfulness</u>
MEB	33
NIQ	34
VUZ	34
ROJ	36
BIY	37
TUP	39
GYR	40
TEV	40
SYF	41
GUD	42
FYZ	43
GOZ	45
HEJ	48
MYK	48
<i>Average</i>	40

LIST 15

<u>Trigram</u>	<u>Meaningfulness</u>
NYG	33
DIY	34
YEM	34
JIZ	36
QAW	37
TYX	38
CIZ	39
YUS	40
LYF	41
FIM	42
DYZ	44
JYF	47
CIB	47
VUL	48
<i>Average</i>	40

LIST 16

<u>Trigram</u>	<u>Meaningfulness</u>
MEH	32
QOD	33
KUX	35
GED	36
JUC	37
BAZ	38
WEZ	39
PEX	40
HUW	41
WIY	42
WYG	45
VEM	46
POY	48
DYR	48
<i>Average</i>	40

LIST 17

<u>Trigram</u>	<u>Meaningfulness</u>
YAG	33
DYK	36
JEC	36
QIM	37
VED	37
YOP	38
LUW	39
QAN	40
VUN	40
GOY	43
VAY	43
RYF	44
LYS	46
SEB	48
<i>Average</i>	40

APPENDIX H

General Instructions (Study 4)

In this experiment, you will be shown lists of syllables to be learned and then recalled. These syllables will be displayed for a brief time interval. After the last item of the list, the experimenter will hand you a recall sheet. You will have roughly 2 min to recall as many items as you can. Please keep trying to recall the syllables for the full 2 minutes. Do not talk to the experimenter unless you have an important question. You may report the items on the recall sheet in any order you wish. Order of recall is unimportant. After every second list the experimenter will ask you to fill out a short questionnaire. Please answer the questions as honestly and accurately as possible.

In order to help you to perform the task, please keep your eyes on the screen.

Please do not get discouraged if you find the task difficult and try to do the task until the end of the experiment.

APPENDIX I

Situational Interest, Task Difficulty, and Motivation Questionnaire (Study 4)

For each of the following questions, please circle the appropriate answer

At the present moment, to what extent do you feel that the retention task is...

	<u>Not at all</u>			<u>Moderately</u>			<u>Extremely</u>		
Interesting	1	2	3	4	5	6	7	8	9
Difficult	1	2	3	4	5	6	7	8	9

At the present moment, why are you performing the retention task?

	<u>Do not</u> <u>Agree at all</u>			<u>Agree</u> <u>Moderately</u>			<u>Totally</u> <u>Agree</u>		
Because it allows me to develop skills that are important to me.	1	2	3	4	5	6	7	8	9
Because I would feel bad if I didn't.	1	2	3	4	5	6	7	8	9
I don't know. I have the impression I'm wasting my time.	1	2	3	4	5	6	7	8	9
Because I feel I have to.	1	2	3	4	5	6	7	8	9
Because I really enjoy it.	1	2	3	4	5	6	7	8	9
Because it's a sensible way to gain meaningful experience.	1	2	3	4	5	6	7	8	9
Because I would feel guilty if I didn't.	1	2	3	4	5	6	7	8	9
Because that's what I am supposed to do.	1	2	3	4	5	6	7	8	9
I don't know. I wonder if I should continue.	1	2	3	4	5	6	7	8	9
Because it's really fun.	1	2	3	4	5	6	7	8	9

APPENDIX J

Instructions Specific to Each Experimental Condition (Study 4)

Appendix J.1 Challenge Enhancement

From now on, please follow the instructions in the paragraph below while doing the memory task. **PLEASE DO NOT WORRY ABOUT YOUR PERFORMANCE.** People have a natural tendency to focus on their performance when they do a memory task. But performance is unimportant to us. What we are really interested in is **HOW YOU FEEL** when you memorize syllables while following the instructions below.

 Challenge yourself to try as hard as you can for all the remaining lists of syllables. Please challenge yourself mentally to do your best **at the beginning of each new list.**

Please give these instructions your best try and don't worry about your performance. What is important to us is that you keep challenging yourself **until the end of the experiment.**

Appendix J.2 Self-Relevant Rationales

From now on, please follow the instructions in the paragraph below while doing the memory task. **PLEASE DO NOT WORRY ABOUT YOUR PERFORMANCE.** People have a natural tendency to focus on their performance when they do a memory task. But performance is unimportant to us. What we are really interested in is **HOW YOU FEEL** when you memorize syllables while following the instructions below.

 The memory task will help you to discover different memory strategies and to exercise your retention abilities. Thus, it will help you to gain efficient retention skills and it will stimulate your memory. Please actively remind yourself of these beneficial consequences **each time you finish recalling the items of a list.**

Please give these instructions your best try and don't worry about your performance. What is important to us is that you keep reminding yourself of the benefits associated with the memory task **until the end of the experiment.**

Appendix J.3 Attentional Involvement

From now on, please follow the instructions in the paragraph below while doing the memory task. **PLEASE DO NOT WORRY ABOUT YOUR PERFORMANCE.** People have a natural tendency to focus on their performance when they do a memory task. But performance is unimportant to us. What we are really interested in is **HOW YOU FEEL** when you memorize syllables while following the instructions below.

 Do your best to concentrate on the retention task and to devote all of your attention to the syllables presented on the screen. If you realize that your mind is wandering, gently bring back your attention to the memory task. Please try to focus as much as you possibly can on the syllables **each time you start a new list.**

Please give these instructions your best try and don't worry about your performance. What is important to us is that you try to keep immersing your attention in the task **until the end of the experiment.**

Appendix J.4 Exploitation of Stimulation

From now on, please follow the instructions in the paragraph below while doing the memory task. **PLEASE DO NOT WORRY ABOUT YOUR PERFORMANCE.** People have a natural tendency to focus on their performance when they do a memory task. But performance is unimportant to us. What we are really interested in is **HOW YOU FEEL** when you memorize syllables while following the instructions below.

 Entertain pleasant thoughts (i.e., pleasant mental images or memories) while you perform the memory task. Please try to conjure up agreeable thoughts **as often as you possibly can** until the end of the experiment.

Please give these instructions your best try and don't worry about your performance. What is important to us is that you keep generating pleasant thoughts **until the end of the experiment.**

Appendix J.5 Introduction of Variety

From now on, please follow the instructions in the paragraph below while doing the memory task. **PLEASE DO NOT WORRY ABOUT YOUR PERFORMANCE.** People have a natural tendency to focus on their performance when they do a memory task. But performance is unimportant to us. What we are really interested in is **HOW YOU FEEL** when you memorize syllables while following the instructions below.

 Vary the approach you use to memorize the syllables **each time you work on a new list.** Do not be afraid to experiment with new strategies or with new combinations of strategies. Once you have identified a few favorite strategies, rotate through them from one list to another.

Please give these instructions your best try and don't worry about your performance. What is important to us is that you keep switching memory strategies between the lists of syllables **until the end of the experiment.**

Appendix J.6 Control Group

From now on, please follow the instructions in the paragraph below while doing the memory task. **PLEASE DO NOT WORRY ABOUT YOUR PERFORMANCE.** People have a natural tendency to focus on their performance when they do a memory task. But performance is unimportant to us. What we are really interested in is **HOW YOU FEEL** when you memorize syllables while following the instructions below.

 In order to help you to perform the task, please keep your eyes on the screen.

Please give these instructions your best try and don't worry about your performance. What is important to us is that you keep your eyes on the screen until the end of the experiment.

APPENDIX K

Reminders Used in Each Experimental Condition (Study 4)

K.1 Challenge Enhancement

**Please keep challenging yourself to do your best
at the beginning of each new list.**

K.2 Self-Relevant Rationales

Please keep reminding yourself that the memory task helps you to improve your retention skills each time you finish recalling the items of a list.

K.3 Attentional Involvement

**Please try to keep immersing your attention in the task
each time you start a new list.**

K.4 Exploitation of Stimulation

Please try to generate pleasant thoughts as often as you can until the end of the experiment.

K.5 Introduction of Variety

**Please keep switching between your memory strategies
each time you do a new list.**

K.6 Control Group

Please try to keep your eyes on the screen until the end of the experiment.

APPENDIX L

Experimental Manipulation Check Questionnaire (Study 4)

On four occasions through the memory task, the experimenter provided you with instructions on a sheet of paper.

	<u>Not at all</u>			<u>Moderately</u>			<u>Very much</u>		
Did you understand clearly the instructions that were described to you?	1	2	3	4	5	6	7	8	9
Did you consistently try to follow these instructions until the end of the memory task?	1	2	3	4	5	6	7	8	9

APPENDIX M

Postexperimental Questionnaire (Study 4)

At the present moment, to what extent do you feel that the retention task is...

	<u>Not at all</u>			<u>Moderately</u>			<u>Extremely</u>		
Interesting	1	2	3	4	5	6	7	8	9
Difficult	1	2	3	4	5	6	7	8	9

At the present moment, to what extent do you feel...

	<u>Not at all</u>			<u>Moderately</u>			<u>Extremely</u>		
Happy	1	2	3	4	5	6	7	8	9
Optimistic	1	2	3	4	5	6	7	8	9
Discouraged	1	2	3	4	5	6	7	8	9
Frustrated	1	2	3	4	5	6	7	8	9
Capable	1	2	3	4	5	6	7	8	9
Anxious	1	2	3	4	5	6	7	8	9
Confident	1	2	3	4	5	6	7	8	9
Tired	1	2	3	4	5	6	7	8	9
Competent	1	2	3	4	5	6	7	8	9

	<u>Not at all</u>			<u>Moderately</u>			<u>Very much</u>		
During the experiment, to what extent did you feel worried about your performance?	1	2	3	4	5	6	7	8	9

	<u>Not at all</u>			<u>Moderately</u>			<u>Very much</u>		
Did you feel comfortable with the experimenter?	1	2	3	4	5	6	7	8	9
Did you feel pressured by the experimenter?	1	2	3	4	5	6	7	8	9

Personal Questions

	<u>Not true</u>			<u>Somewhat true</u>			<u>Very true</u>		
I sometimes tell lies if I have to.	1	2	3	4	5	6	7	8	9
I never cover up my mistakes.	1	2	3	4	5	6	7	8	9
There have been occasions when I have taken advantage of someone.	1	2	3	4	5	6	7	8	9
I never swear.	1	2	3	4	5	6	7	8	9

I sometimes try to get even rather than forgive and forget.	1	2	3	4	5	6	7	8	9
I always obey laws, even if I'm unlikely to get caught.	1	2	3	4	5	6	7	8	9
I have said something bad about a friend behind his or her back.	1	2	3	4	5	6	7	8	9
When I hear people talking privately, I avoid listening.	1	2	3	4	5	6	7	8	9
I have received too much change from a salesperson without telling him or her.	1	2	3	4	5	6	7	8	9
I always declare everything at customs.	1	2	3	4	5	6	7	8	9
When I was young I sometimes stole things.	1	2	3	4	5	6	7	8	9
I have never dropped litter on the street.	1	2	3	4	5	6	7	8	9
I sometimes drive faster than the speed limit.	1	2	3	4	5	6	7	8	9
I never read sexy books or magazines.	1	2	3	4	5	6	7	8	9
I have done things that I don't tell other people about.	1	2	3	4	5	6	7	8	9
I never take things that don't belong to me.	1	2	3	4	5	6	7	8	9
I have taken sick-leave from work or school even though I wasn't really sick.	1	2	3	4	5	6	7	8	9
I have never damaged a library book or store merchandise without reporting it.	1	2	3	4	5	6	7	8	9
I have some pretty awful habits.	1	2	3	4	5	6	7	8	9
I don't gossip about other people's business.	1	2	3	4	5	6	7	8	9

Background Information

- Gender: Male ☐ Female ☐
- Age: _____
- Mother tongue: English ☐ French ☐ Other ☐ Please specify: _____
- Other languages that you can
 - Read _____
 - Speak _____
 - Write _____
- Citizenship: Canadian ☐ Other ☐ Please specify: _____
- Marital Status: Single ☐ Married ☐ Common law ☐ Divorced ☐

7. Do you have children? No ☐ Yes ☐ How many? _____
8. I am a full time student Yes ☐ No ☐
9. I am presently in my 1st ☐ 2nd ☐ 3rd ☐ 4th or higher ☐ year of university.
10. My grade point average so far in university is: _____.
11. My grade point this term should be around: _____.
12. What is your intended major? _____.
13. Do you work full time? No ☐ Yes ☐
- How many years have you been in the job market? _____.
- What is your profession? _____.
14. Please check the category which best describes

Your income before taxes:

- ☐ Less than \$12,000/year
- ☐ \$12,000 to \$19,999/year
- ☐ \$20,000 to \$39,999/year
- ☐ \$40,000 to \$59,999/year
- ☐ \$60,000 to \$79,999/year
- ☐ \$80,000 to \$99,999/year
- ☐ More than \$100,000/year

Your spouse's income before taxes:

- ☐ Less than \$12,000/year
- ☐ \$12,000 to \$19,999/year
- ☐ \$20,000 to \$39,999/year
- ☐ \$40,000 to \$59,999/year
- ☐ \$60,000 to \$79,999/year
- ☐ \$80,000 to \$99,999/year
- ☐ More than \$100,000/year

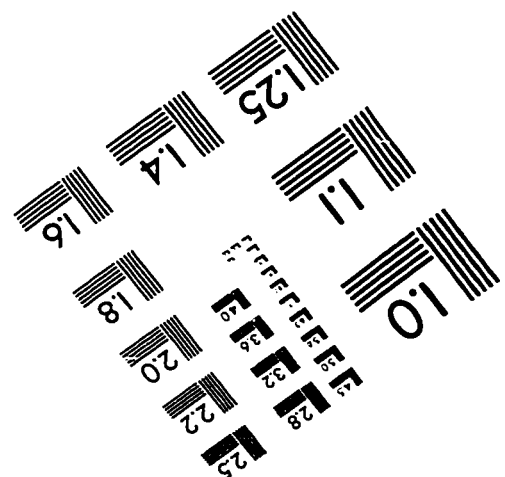
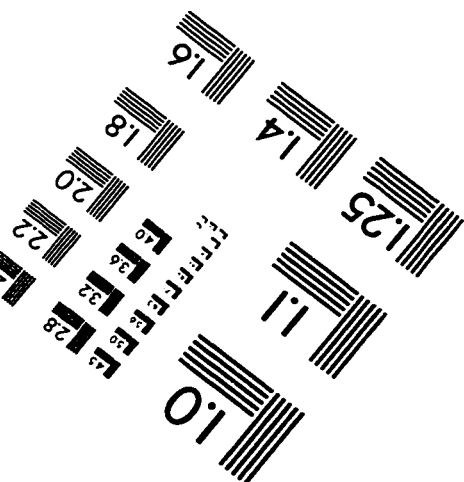
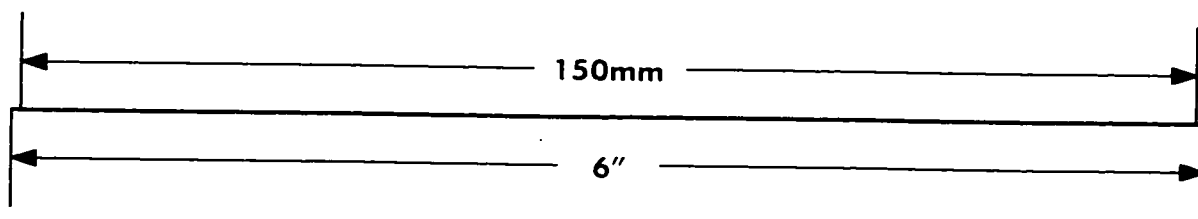
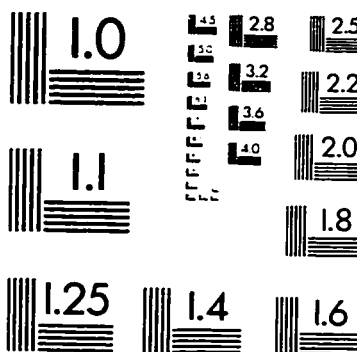
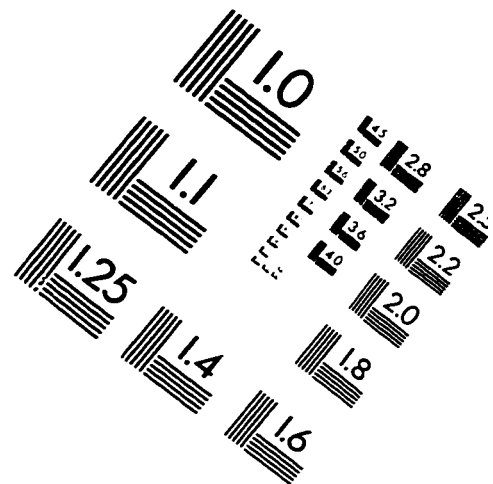
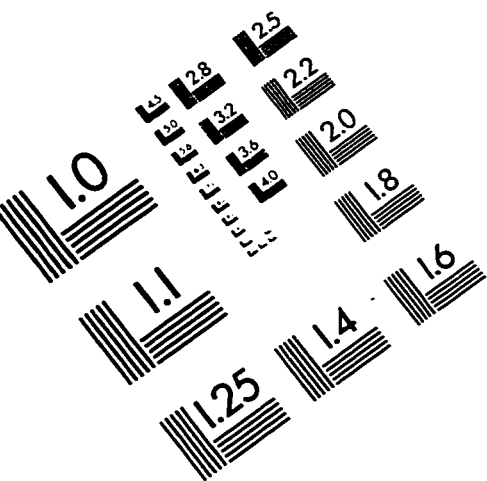
We are considering performing more testing using the retention task you performed today. Would you be available for additional testing sessions?

Please circle the number of testing sessions you would be willing to volunteer for:

0 1 2 3 4 5 6 7 8 9 10

Thank you very much for your time! It is greatly appreciated!

IMAGE EVALUATION TEST TARGET (QA-3)



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