

MOTIVATION AND EPISODIC MEMORY PERFORMANCE

Leonard Ngaosuvan

<Infoga logotype UmU>

Department of Psychology
Umeå University, Umeå, Sweden
2004

Ngaosuvan, L. (2004). *Motivation and Episodic Memory Performance*. Doctoral Dissertation from the Department of Psychology, Umeå University, SE-901 87 Umeå, Sweden: ISBN 91-7305-721-5.

ABSTRACT

In everyday life, motivation and learning are connected like music and dancing. Many educators realize this and work hard to improve their students' motivation. A motivated student may repeat and self-rehearse the content of a chapter more often, which leads to better learning. However, from a cognitive psychology point of view, it is still uncertain if motivation without differences in repetition or attention, affects episodic memory performance. That is, would a motivated student perform better compared to a less motivated peer if they both have same level of previous knowledge, attention and rehearsal? The number of studies in this field is scarce, and some studies are limited by methodological issues, and others indicate that motivation does not affect episodic memory performance. The overall aim of this thesis was to develop a motivational instruction that facilitates or affects memory performance, and to characterize the underlying mechanisms of this potential effect. **Study I** examined if reward competition would affect word and source recall as well as word recognition. Following the self-determination theory of motivation, Study I also included subjective ratings of intrinsic and extrinsic motivation. The results showed dissociation between experienced motivation and actual memory performance. **Study II** involved goal-setting and ego-involvement (stereotype threat) as motivators in the context of a word recall task. The results showed that goals and ego-involvement had no effect on performance. **Study III** manipulated competition motivation by a combination of group process (group vs. individual) and chance of winning (high vs. low) to in two experiments. The results suggested that both chance of winning and group process can affect episodic memory performance. **Study IV** extended these findings by showing a complex interaction among group process, chance of winning, and gender. Specifically, male participants were more subjected to group process and chance of winning than female participants in memory performance. Taken together, the present studies show that memory performance is relatively impervious to motivational influence, but that a combination of reward competition, group process and chance of winning can affect episodic recall performance. Presumably, the underlying mechanisms through which motivation affects episodic memory performance is that motivated participants generate more possible items to familiarize themselves with during memory retrieval than less motivated participants.

ACKNOWLEDGEMENTS

First of all, I would like to thank my supervisor, Timo Mäntylä, for his honesty, his courage to enlist me to the graduate program to begin with, his straightforward way of teaching academic skills, and his love of science. Furthermore, during the production of this thesis, Timo has let me have relatively free reign, which I appreciate greatly.

Bo Molander read earlier drafts, and commented on them in a very insightful way, and has been supportive overall. Peter Juslin gave me courage to think in the bigger perspective. I thank Bengt-Åke Armelius for pushing me to finish the thesis, and Lars Nyberg for always welcoming me and answering my questions.

Lars-Göran Nilsson has from the beginning of my thesis work always been a fantastic source of inspiration. I am proud to contribute to his academic "memorial family tree", and I am happy to be mentioned in his mental black list.

Numerous colleagues have both discussed and helped me further academic growth. I would especially like to mention Henrik Olsson (the epitome of a scientist), Annika Nordlund (who truly is better than God), Jonas Persson (whose inner thoughts finally were revealed), and Pierre Gander (who have spell-checked and discussed early drafts).

Other co-workers have helped me to improve my teaching skills, though not always in pleasant situations. For this, I am indebted to Margit Tornéus, Michael Gruber, and Tomas Kalén. Also, a major part of my teaching assignments have been at the Department of Computing Science, where I have had the pleasure of meeting Pedher Johansson, Stefan Holmgren and many other interesting scientists and teachers.

Several administrators have helped me with my strange computer issues throughout the years at the department. I would like to thank Jan-Åke, Max, Gunnar, and above all Santi Ngaosuvan, my older brother who, even though he works at another institute, has endured the most obnoxious of little brothers helping me with computer problems, and being a true friend through all weathers.

Colleagues such as Arne Börjesson (who readily discusses many controversial matters during lunch), Steven Nordin and Grazia Carelli (who always presents a happy face when we meet), Anders Böök, Daniel Broman (for his social activities and generosity), Erik Domellöf (for his fearlessness when cracking jokes and appreciation of my weird ones), Anna-Carin (who laughs at my dance steps), Jonas, Stefan Söderfjell, Saoli-chan (for all the laughs and teaching me some Japanese – kawaii!), and many others at the Department who have all made my working days (and sometimes nights) a pleasure.

Others at the department have reminded me that there are other important matters to consider than science and psychology, people like Anna Sundström, Mona Feng, Jaanus Raudsepp, Sverker Sikström, and Margaret Gärding have spoken to me about life and freely shared their experiences and insights to a young man like myself. These discussions have made me wiser in mind, though not always in action. I value these conversations highly.

I am happy for the love and support I have had from "Huff" and "Pupp" through the years, and "PALLMSWAJJ" who have blessed me with great tolerance. Without you, things would have been so much harder. I would also like to thank "Fnuff" for the dreams, and making life truly exciting. I owe a lot to my friends, some of which I have lost, and some that I still have left. I wish to thank DG, GG, ZK, PL, TP, JR, PJ, FT, LF-H, MS, JH, IL, DH, and S & M for their friendship and sticking around.

Umeå, August, 2004

Leonard Ngaosuvan

LIST OF PAPERS

- I. Ngaosuvan, L., & Mäntylä. (2003). Rewarded remembering: Dissociations between self-rated motivation and memory performance. Manuscript submitted for publication.
- II. Ngaosuvan, L. (2004). Ego-involved goal setting and memory performance. Manuscript submitted for publication.
- III. Ngaosuvan, L. (2004). Motivation and memory: Chance of winning in social and individual recall competition. Manuscript submitted for publication.
- IV. Ngaosuvan, L. (2004). Motivational effects on memory: Chance of winning, group structure, and gender. *Umeå Psychology Reports*, 5, 1-9.

CONTENTS

INTRODUCTION.....	1
CONCEPTUAL BACKGROUND	3
A brief history of motivational research.....	4
The development of motivational thoughts	4
The emergence of cognitive science	7
Self-determination theory	9
Self-efficacy theory.....	12
Goal-setting.....	15
Social influence.....	17
RESEARCH OBJECTIVES	20
SUMMARY OF EMPIRICAL STUDIES.....	21
Study I: Item-specific bias, self-rated motivation and memory performance.....	21
Study II: Ego-involved goal setting and memory performance	24
Study III: Motivation and memory: Chance of winning in social and individual recall competition	26
Study IV: Motivational effects on memory performance: Chance of winning, group structure, and gender	29
RELATION BETWEEN MOTIVATION AND MEMORY	31
Activity level in mental representation	32
Intentional superiority effect.....	32
Mediation through strategies	33
Efficient encoding.....	33
Persistent retrieval.....	34
Internal conflict hypothesis.....	37
CONCLUSIONS AND DISCUSSION	39
REFERENCES	43

INTRODUCTION

For a very long time, humans have wanted to do things and have been able to do things. However, being able to do one thing does not imply wanting to do it, and vice versa. Still, there is a clear relation between what we know (cognition) and what we want (motivation), as many of our desires are based on knowledge and information. For instance, in order to want to become a professional athlete, one must know that it is possible to make such a living in the first place. Perhaps most obvious bridge between motivation and cognition is education. In many cultures, the first two decades of our lives are designated for the learning of many different and challenging skills. This learning is helped by motivation, because it guides general learning behavior, which often means more repetition instances and longer practice times. That is, by spending more time studying, learning is improved. Thus, motivation by way of changing habits and behavior can improve learning in a quantitative manner, which makes motivation one of the key concepts in educational settings. This is often expressed in terms of issues and problems, as teachers can experience that students suffer from poor motivation to learn important skills. Some students blame their poor motivation when faced with their own inadequate learning performances. In fact, many college students prepare their failures beforehand, salvaging their sense of self-worth by using one or several self-handicapping strategies, such as procrastination, staying "busy", or setting impossible goals (Covington, 1984). Therefore, educational psychologists have theorized and investigated on how to make people motivated in areas where the students initially are not. However, the question whether motivation improves learning in a qualitative manner (i.e., actual memory performance) is still not fully explored. For instance, if a motivated student spends an equal amount of time as an unmotivated student learning (given similar previous knowledge), would any differences in memory performance occur?

This thesis is concerned with the relation between motivation and cognition. The main objectives of the thesis were to investigate *how* to motivate people to perform well in episodic memory tasks, and to test whether these different states of motivation could affect episodic memory performance. Consequently, the primary focus of the dissertation was on motivational mechanisms, rather than on basic memory processes.

The thesis begins with a short description of the purposes of the empirical studies (Study I-IV), followed by a chapter on motivation as a psychological concept. The chapter presents a brief historic perspective, as well as a review of the empirical findings that connect motivation and

episodic memory performance. The following chapter presents a summary and a more in-depth discussion on the empirical work in the thesis. Last, an integrative chapter discusses the relation between motivation and episodic memory performance from a more theoretical perspective, and under which circumstances motivational effects on memory performance are most likely to occur.

Study I aimed to cover some of the most prevalent methodological limitations of the past studies of motivation and episodic memory performance. Among these issues, item-specific bias was the most critical problem along with lack of measurements to control whether the motivator had any impact on subjective ratings of motivation. Furthermore, to obtain a more reliable account of episodic memory performance, source recall was used as a dependent measure. Subjective ratings were measured within the self-determination theory (Deci & Ryan, 1985).

Previous studies indicated that goal-setting increased recall performance over several trials (West, Welch, & Thorn, 2001). Thus, Study II aimed to investigate the effects of goal setting (Locke & Latham, 2002), and ego-involvement (Nicholls, 1984) on memory performance. The notion of ego-involvement (stereotype threat) was added to create a more original motivational instruction, and put more focus on the participants' selves.

Following this line of combining several motivational frameworks, Study III examined if competition style (team vs. individual competition) and chance of winning (high vs. low chance) in coalition could affect episodic recall performance. In order to delve further into the mechanisms how motivation affects memory performance, a supplementary experiment was conducted. This supplemental experiment consisted of a content learning task and a recognition task. Study IV's primary aim was to replicate the findings in Study III, and to broaden the scope of the findings by including gender as a factor in the study.

CONCEPTUAL BACKGROUND

The purpose of this chapter is to introduce early thoughts on motivational issues, and to present a more updated, but selective, description of motivational psychology, relevant for the thesis' empirical parts. Furthermore, the purpose is also to review the studies that have investigated motivational influences on episodic memory performance. Considering past empirical research, four theories or frameworks have emerged as the most prominent ideas on motivation and episodic memory performance, namely, self-determination, self-efficacy, goal-setting, and social influence. In addition, relevant concepts and distinctions of memory are introduced when appropriate. Reflecting the primary focus of the thesis, the reader is expected to be more familiar with memory psychology than motivational psychology.

General definition of motivation

Motivation is a quite recent concept (Confer, 1980), as other labels were used prior to the 20th century. Coinciding with massive increase in psychological research in the 20th century, motivation as a concept, was broken down in numerous different theories to the point of conceptual confusion (Schunk, 2000, see also Murphy & Alexander, 2000). Generally, motivation refers to an organism's drive to a certain behavior. This effortful behavior is mostly directed to a particular outcome, such as finding a book, or directed to put the organism in a state, such as avoidance of pain. Thus, motivation is mostly used in task-specific terms, and is regarded more as a temporal, and relatively changeable state, and not as a permanent attribute or trait. A typical trait of motivational state is that it can change quickly given new stimulus, or changes in the environment. Furthermore, this drive is broken down into three components: initiation, intensity, and persistence (Geen, 1995). Initiation is a notion of the readiness an organism has to start a certain behavior. For instance, some pupils start learning math more easily than others who need more attention and encouragement to start learning. Intensity is a measure of how much effort is put down to complete an already started task within a limited time frame. Consider a young college student trying to improve her tennis skills, intensity would be how many shots and serves she would attempt in a single training session, or how close in time she would choose to have those training sessions. Persistence is how long some level of intensity can be upheld. A time measure on how long a pupil keeps on trying to master a task, or how many attempts a person performs

before giving up a task would be typical measures of persistence. In the tennis example above, persistence would be how many training sessions the young student would attend. The examples of the previously motivational stages are of quantitative nature, and can easily be measured experimentally. However, there is nothing that stops qualitative measures of these three stages of motivation. For instance, one can obtain information about all stages by interviewing participants and by observing natural behavior. Furthermore, the aforementioned definition is reasonably general in the sense that all motivational theories should be able to explain these three components of motivation. However, some theories are more focused on one component than the others.

A brief history of motivational research

The purpose of this section is to provide a brief introduction to the emergence of thoughts that aimed to explain human behavior in early science, and thereby present an understanding of the contemporary motivational theories from a historic point of view. This historic view is limited to western culture or scientific thinking. Motivation has a very long history in the sense that people have been trying to explain human behavior in early academia. Specifically, traces of epicurean hedonism, voluntarism, and mechanistic materialism are still very much present in recent theories, although in different shapes and forms (Geen, 1995). Also, it is important to note that this section is a selection of early thoughts of human behavior, and recent theories relevant for the thesis empirical works. For a more comprehensive read on motivational history, see the works of Graham and Weiner (1996), and Geen (1995) and Weiner (1990). The section is divided in two parts: historic developments and recent thoughts in the 20th century. The first part introduces classical explanations of human behavior, and the second part contains a selection of theories that dominated educational psychology. The focus on educational psychology was chosen because its closeness to motivation and memory.

The development of motivational thoughts

The general idea to describe and explain human behavior has very old roots in early philosophical ideas. The notion of *epicurean hedonism* tells us that the search for pleasure and the avoidance of pain constitutes important aspects of human behavior. Furthermore, alternative ideas emphasized the virtue to willingly adapt oneself to the environment (stoicism), as well as trying to reach one's full capacity can be traced back

to Aristotle. Also, numerous moral philosophers have pointed out that members of a community have responsibilities towards the other members. Thus, motivational ideas have been considered since antiquity. These ideas were later opposed by religious influences that emphasized normative ideas on human behavior, that humans' desire for hedonistic pleasure was inherently unfitting, and the failure to resist those urges would result in social detachment from the core communities. These notions were based on *voluntarism*, which proposed that humans have a divine soul and a free will (volition) and that the choices should be made in accordance to religious teachings. Although prescriptive behavior is today abandoned in most motivational research, the notion of voluntarism is still very active and important, in its focus on the self. Many contemporary theories are based on the self, and its choices and experiences.

Along with technological and scientific advances, *mechanistic materialism* emerged and compared the human to a machine. Along these lines, human behavior was reflexes guided by external stimulus. This view is the initiation of physiological psychology (Geen, 1995). Following the philosophical progress from rationalism to empiricism, which viewed the human as a product of experience and knowledge, as opposed to a container of a soul, hedonism resurfaced. The empiricist view described human behavior in terms of knowledge of prior experiences, disregarding the notion of a pre-existing soul. Humans behave in order to enjoy the consequences of their actions. In retort, Kant agreed that the soul was nothing more than a sum of impressions and experiences. However, Kant suggested that humans have a transcendent and a central self enabling a human to make conscious (and moral) choices, which brought the notion of voluntarism back, albeit in a different shape.

In the 19th century, Darwin presented the notion of instincts, by reducing the separation between animals and humans and emphasizing unconscious drives in humans. Instincts were thought of as “hard-wired” behaviors that innately existed in humans, and therefore were the cause of behavior, rather than a description of behavior.

Instinct theories were replaced by behaviorist ideas that interpreted behaviors (responses) as reactions from external stimuli, as opposed to inherent structures. Skinner (1953) formulated an elaborated version of hedonism in his reinforcement theory. In essence, reinforcement theory is based on the notion that consequences regulate behavior. In this view, people's behaviors are mainly affected by proper administration of rewards and punishments associated with actions. Although this theory been very influential, it still does not solve the major issues with hedonism that

voluntarism brought to light, what rewards or punishments to choose for different individuals.

Contemporary with Skinner, Hull (1943) presented a theory of drive. Drive theory suggested that human behavior is function of drive multiplied with habit. Drive is defined as a reaction from deprivation of critical components or powerful stimulus. Drive is the product of physical discomfort and the provocation to reach comfort. However, this provocation is non-directional. Habit is the connection between stimulus and response, and it serves as the direction of behavior. More important, drive theory was a revival of mechanistic materialism as it presented human behavior in a machine metaphor.

Studies in line with drive theory soon discovered that deprivation of drive was not the single factor influencing motivation. That is, humans are underachieving when stimulation is too low or too high. This finding is captured in both arousal theory and the Yerkes-Dodson Law (Yerkes & Dodson, 1908). The notion of optimal level of stimulation stipulates that an induction of motivation should not be too powerful, as it would mean overmotivation, or too low level of power would be disregarded. However, although this is perfectly reasonable, it has very little bearing on how motivation would affect cognition. Consider an induction that failed to affect episodic memory performance. In terms of optimal level, one can always claim that there is an optimal induction of motivation that would affect memory performance, but that the induction in question failed to find it. Thus, even if motivation is unable to affect memory performance, the notion of optimal level can never be falsified experimentally. On a side note, the idea of optimal level was re-actualized in recent years in the concept of flow (e.g., Csikszentmihalyi, 1997).

Contemporary with drive theory, Lewin (1963) presented the field theory of motivation, which proposed that behavior is dependent on individual and external stimulus. To achieve a goal by changing objects in the environment, three major variables affect an individual, namely, tension, extent of a need or valence, and the subjective experience of how far away the goal is. Tension is derived from the notion of homeostasis, which suggests that organisms constantly seek a state of equilibrium, and within field theory, deviation from the optimum state create tension. Tension does not only include physical matters. Needs initiate goals to minimize tension, and these goals have different magnitudes depending on the nature of the tension. Finally, for each goal, there is a psychological distance between the present state and the goal state. This distance is negatively related to the level of motivation. That is, the shorter the psychological distance, the greater the force.

The emergence of cognitive science

In contrast to Hull's mechanistic views of human behavior, the notion of cognition began to take more space in psychology in the 1950's, as well as other related academic disciplines (Gardner, 1984). The cognitive view stipulated that motivation mainly stemmed from a human's beliefs and thoughts, as opposed to instincts, drives, habits and reflexes (Ames & Ames, 1984). Motivational research became more focused on human participants, particularly the thoughts and subjective experiences of humans, and habit was gradually replaced with expectancy. In earlier ideas, the focus had been to study what makes humans enact, whereas expectancy-related research were more interested in direction of behavior. Additionally, explorative actions, such as frustration and anger were reviewed. Furthermore, motivation was linked to typical cognitive science areas such as learning, perception, and memory (e.g., Weiner, 1966).

The premises of expectancy-value theories are that humans behave in order to reach goals, and that the perceived chance of reaching them and the subjective value of reaching them are the critical factors. One of the more dominant theories utilizing these ideas was achievement motivation (Atkinson, 1964), which proposed that motivation to reaching goal is a multiplicative relation between need for achievement, likelihood of success, and subjective value of success. Furthermore, the interest in teaching caused an increased number of studies set in classrooms.

As the studies on humans increased, a focus on individual differences emerged. Ideas such as differences in high or low anxiety, high or low total achievement desires, and locus of control were all happily received by educational psychologists who focused on high or low performing students. Scales were developed to assess different factors that all constituted a subset of individual differences (Graham & Weiner, 1996).

With the emphasis on subjective values and individual differences, voluntarism took over and dominated motivational research from the 1970s and forward. Voluntarism heavily emphasized the self, which is the modern version of antiquitous terms soul and free will. By focusing on the self, without boundaries imposed by normative structure (to either follow or suffer the consequences), numerous theories were formulated. One could argue that the cognitivist view of motivation is a new version of voluntarism. Ideas such as self-worth (Covington, 1984), self-efficacy (Bandura, 1997), task versus ego-involvement (Nicholls, 1984), and self-determination (Deci & Ryan, 1985) are all heavily influenced by the self as a concept.

The most influential frameworks in the 1960's have almost disappeared in modern motivational psychology. Weiner (1990) pointed out that this is a pity, because it is what motivational psychology needs. For instance, self-determination theory (Deci & Ryan, 1985), which is important for the cognitive view of motivation, is underdeveloped because it is not within a system of concepts with other related ideas. Derivatives of achievement motivation are valiantly in the center of attention within motivational psychology. Power motivation, affiliation, exploratory behavior, curiosity, altruism and aggression are all specific variants of achievement motivation. The favor of detailed theories within achievement theory may not be particularly beneficial for educational psychology, because the development of the general ideas is halted (Weiner, 1990).

Weiner predicted that the self would be a more specific field of research of motivation (Weiner, 1990). It turned out to be a correct prognosis (Tesser, 2000), and the self can be described from many perspectives in motivational research (Tesser, Stapel, & Wood, 2002). Individual differences were decreased in number, and the reason for that was a lack of generality over several situations. Achievement motivation is highly situational and context-dependent. Also, locus of control was correlated to a lot of variables, but not to the most theoretically linked concept: success expectancy. The latter is Weiner's wish of a "psychology of the individual". Weiner concludes that in only 60 years of research, much has happened; drastic changes in metaphors, new influential concepts introduced, important phenomena discovered. Thus, motivational psychologists have a lot of hard work in front of them, but it is a favorable position compared to the alternative.

It is important to acknowledge that the onset of the thesis only partially benefits from motivational theories. Motivational theories are mainly focused on issues that explain human behavior, as opposed to human cognition. Motivational psychologists want to know why a certain individual performs a certain cause of action, and to what extent the person is willing to make sacrifices to continue this action. Sometimes, the answer is simple and straightforward, hungry individuals often seek food. The easy answers are almost invariably descriptions on why a person performs an action. A much more difficult task is to actually motivate someone to do something which they did not initially want to do, and further to explain what cognitive consequences such success would imply. One of the most popular issues is how to motivate school children to learn scholastic subjects within the academic format.

Motivational theories are almost exclusively concerned with behavioral changes, and not motivational effects on cognition. Therefore, the usefulness from past motivational theories are limited in the present context, and mainly answers the first question on how to make people more motivated to perform a certain task. However, the distinction between behavior and cognition is a difficult one, as cognitive psychologists often measure cognition in terms of behaviors which they believe are intimately linked to cognitive abilities, such as response latencies, recall performance etc. Motivational psychologists, in contrast, tend to measure the effects of a motivator in ways that are less controlled but more ecologically valid for educational situations. For example, the present thesis used immediate episodic recall, where the impact of unknown behavior is minimized, because the time to do something else between encoding and retrieval is so short. This is regarded as a cognitive measure compared to, for instance, grades pupils receive six months after motivational induction. The latter measure lacks control of the participants' behavior, such as increased amount of parental teaching, extra classes and so on, which in turn may explain higher grades. The latter study cannot evaluate how motivation affects cognition in a direct way, although for educational purposes, the mechanism behind the higher grades may not matter that much. Nonetheless, certain patterns of empirical results or motivational theories have presented important and relevant insights for motivation and memory research, namely, self-determination, self-efficacy, goal setting, and social influence.

Self-determination theory

Deci and Ryan (1985, see also Ryan & Deci, 2000) hoped that their theories and research could help people finding liberty, and increase human freedom. Self-determination is a theory aimed to contrast mechanistic and organismic theories. It is also focused on the state-aspect of motivation. The major objection to the mechanistic framework is its inability to explain animals' exploration and manipulation of the environment. White (1959) added the notion of effectance motivation which suggested that organisms strive to be effective and competent in their interaction with the environment. Deci and Ryan claimed that intrinsic motivation and self-determination as concepts were necessary for organismic theories. The more psychologists acknowledge these concepts, the more organismic theories are developed. Organismic theories assume that humans act on both internal and external environments to be effective, and that these factors interact to satisfy almost all the organism's needs. Self-determination theory is heavily focused on the interaction

between the internal and external environments. The core notion in self-determination theory is intrinsic motivation, which is defined as "the doing of an activity for its inherent satisfactions rather than for some separable consequence" (Ryan & Deci, 2000, pp. 56). This notion is contrasted with extrinsic motivation, often induced by external rewards, which is explained as the behavior performed because of its consequences. The major empirical interaction between the internal and external environments is the undermining effect of external rewards on intrinsic motivation (Deci, Koestner & Ryan, 1999). That is, if a person is doing something for the sake of it and suddenly becomes subjected to a competition, deadline, or controlling surveillance for that, initial activity, then the person is very likely to develop new reasons for the behavior. Such external factors often cause a gradual shift from intrinsic motivation to extrinsic motivation. Although, Deci and Ryan (1985) almost exclusively mentioned the shift from intrinsic motivation to extrinsic motivation, it should be noted that the opposite direction is also possible.

Ryan and Deci (2000) divided extrinsic motivation into external regulation, introjection, identification, and integration. Also, amotivation was added as a description of a state where the individual has no intention to act. External regulation is the state, within extrinsic motivation, that is the farthest away from intrinsic motivation, and the most typical description of extrinsic motivation. External regulation refers to the behavior that is purely performed because of the rewards, punishments, or outside forces. People often experience that they are being controlled by these external factors. Introjected people also feel that they are controlled. However, this is evidenced in a less direct way. Introjected behavior means that the behavior is driven by the avoidance of shame or guilt, or the reinstatement of self-esteem or pride. Identification is much more self-determined. In this case, people have to accept that in order to reach a goal that they have chosen themselves, they also must reach other goals that they have not chosen. For instance, a college basketball player may truly wish to become a professional player, but she realizes that she must perform sufficiently well on the academic tasks to continue her basketball college training. Thus, she makes the new goals her own. However, these new goals are still extrinsic. Should the need of them be removed for her to achieve her initial goal, she would probably stop pursuing them. In time, she may learn to like the related fields such as mathematics, and the new goal may become truly enjoyed. If she enjoys math so much that she continues to study it long after her initial goal is met, the study of math becomes integratedly regulated.

Deci and Ryan (1985) presumed that humans can choose to interpret events, objects, and actions as either informational, controlling, or amotivating. Thus, any given instruction can be interpreted as any of these orientations, given the self-disposition and personality of the person. The self in self-determination must be a transcendental self, as the self precedes the interpretation of the event. In addition, this conclusion makes the first thesis topic a very difficult one. Praise, a motivator that many rely on in everyday life, is also subjected to this dependency (Henderlong & Lepper, 2002).

Typically, intrinsic motivation is measured as freely chosen time spent on task, or subjective ratings (Ryan & Deci, 2000). A classic study showed that participants paid for solving puzzles did not continue as extensively in puzzle solving compared to non-paid participants after they believed that the experiment was over (Deci, 1971). Thus, according to self-determination theory, a standard motivator such as monetary reward may not be effective because it does not increase intrinsic motivation, which in turn may be the critical type of motivation for learning. In terms of empirical evidence for intrinsic motivation and learning, studies found that children allowed to choose computer representation of a math learning game experienced greater intrinsic motivation as well as learning arithmetic skills (Cordova & Lepper, 1996). Furthermore, a child text learning study compared an intrinsic motivator ("to discover what could be learnt") with an extrinsic motivator ("to get a grade"), and the results showed that the intrinsic motivator was more effective in terms of text recall (Grolnick & Ryan, 1987). However, the test was subject-paced, which means that the result can be explained in terms of reading time, which probably is increased by intrinsic motivation. Nonetheless, the study presented an example to induce intrinsic motivation, or at least contrast it with extrinsic motivation. On the downside, instructions aimed to increase intrinsic motivation may be more effective for children who do not know so much about their own interests as adults do. Also, adult text learning studies may also be confounded by previous knowledge.

Taken together, the insights presented within the self-determination theory are vast and important, particularly the notion that some motivators might very well reduce motivation and performance in general. Thus, a teacher may get better learning results from students by doing nothing, compared to presenting a motivator that increases extrinsic motivation. In similar vein, doing nothing may be an optimal level of motivation in terms of intrinsic motivation. Participation in a memory experiment may be exciting as such, and participants often want to perform their best for their own sake, which is close to intrinsic

motivation. This notion could explain why there are so few reported results where a motivational induction significantly augmented episodic memory performance over control instructions. However, this notion does not imply that teachers should do nothing in educational contexts. Everyday school attending is probably not as exciting and inherently interesting as participation in an authentic research project.

However, there are some unclear parts relevant for motivation and episodic memory performance, as well as some general criticism. For instance, the self-determination theory fails to clearly take a stand on whether or not a person can experience several types of motivation concerning one particular behavior. Alternatively, the self-determination can only identify the type of motivation in simple and one-dimensional activities. Consider doing psychological research, which consists of many different components (e.g., planning experiments, collecting data, writing reports). It is possible that a researcher is approaching the different components with variable levels of enthusiasm. Collecting data could be identification whereas planning studies could be intrinsically motivated. Given the complex nature of many activities, it can be very hard to define type of motivation for the total behavior.

Another criticism is the induction of intrinsic motivation. In the aforementioned child study, intrinsic motivation and math performance were both increased by choice. Freedom and choice are the core elements in self-determination theory, and choice as an experimental motivator should be the queen of all motivators. However, choice per se is not always beneficial (Iyengar & Lepper, 2000). Also, the notion of choice is mediated by cultural factors (Iyengar & Lepper, 1999). Presumably, these cultural differences in intrinsic motivation are, in turn, mediated by self-orientation (Markus & Kitayama, 1991). Thus, self-determination theory does not present a clear path to increase intrinsic motivation experimentally in the memory laboratory.

Self-efficacy theory

Perceived self-efficacy is defined as the "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Bandura discussed the level, generality, and strength of self-efficacy across activities and situations. Level of self-efficacy is the dependence on the difficulty of a particular task. Generality is how much self-efficacy can be jumping across different areas. Strength of perceived self-efficacy is the person's certainty to perform a task. There are four major factors that influence self-efficacy, namely, enactive attainment, vicarious experience, verbal persuasion, and

physiological states (Bandura, 1986). Enactive attainment refers to the self-efficacy increased by one's own personal experiences, and is probably the most powerful inducer of self-efficacy. Next in line, there is the learning of others' behaviors and experiences. One can reason, "If they can do it, so can I". Verbal persuasion can be effective, but only if the instructor is credible. Surprisingly, this is probably a very common way to motivate people in spite of its relatively low level of impact. Physiological states are clear indicators on how capable one feels. If you feel sick and tired, you do not believe that you can complete difficult tasks more than if you were feeling physically great.

Self-efficacy is, naturally, closely related to other concepts that include the self, such as self-concept, and self-worth, and outcome expectations. However, they differ in theory, and in assessment. Bandura (1986) found that self-efficacy was much more powerful in explaining variance in reading achievement than outcome expectancy. Self-concept is relatively close conceptually, but self-efficacy is more directed towards mastery than self-concept which relies more on social comparison (Bong & Clark, 1999). However, self-efficacy is also influenced by social comparison or vicarious experiences (Schunk, Hanson, & Cox, 1987), particularly when personal experiences are limited (Bandura, 1997). The notion of vicarious experience creates a delicate problem in distinguishing motivators stemming from self-efficacy and other ideas. This issue becomes more evident when trying to induce motivation by way of self-efficacy rather than explaining the conceptual differences. Also, methodological differences between studies of the concepts have blurred the interpretation of results and the possibility to differentiate them (Bong & Clark, 1999).

Furthermore, self-efficacy should not be confused with self-worth theory which connects self-tolerance and personal performances (Covington, 1984). Studies in mathematics learning have found that math self-efficacy was more determining for math problem solving than math self-concept, perceived usefulness of math, prior experience with math, or gender (Pajares & Miller, 1994). Furthermore, self-efficacy predicted actual math exam performance better than self-concept (Pajares & Graham, 1999; Pietsch, Walker, & Chapman, 2003).

Perceived control emerged from research on locus of control. Perceived locus of control is the general expectancies about whether outcomes are controlled by one's own behavior or by external forces. Presumably, internal perceived locus of causality should reinforce self-directed courses of action, and external perceived locus of causality should do the opposite. Academic performance and pressure reduction in high-

anxiety students in a coping skills training program was predicted by self-efficacy, whereas perceived locus of causality measures did not (Smith, 1989). Thus, the case can be made that self-efficacy differs from other ideas conceptually, as well as empirically (Zimmerman, 2000). As a consequence, the role of self-efficacy in academic motivation and learning is clear and evident (Bandura, 1997). Self-efficacious students participate more readily, work harder, persist longer, and cope better with adversity than students with low self-efficacy. Furthermore, self-efficacious students choose more challenging goals. Self-efficacy helps students to cope with emotional issues concerning academic achievement. Self-efficacy beliefs are predictive of effort (and persistence). Both rates of performance and energy expenditure correlate with self-efficacy. Thus, Bandura claims, self-efficacy beliefs motivate learning, mediated by goal-setting, self-monitoring, self-evaluation, and strategy use. Self-regulation is an important factor supported by self-efficacy. In contrast to trait measures of self-perception, self-efficacy focuses on cognitive beliefs that already have been enforced by experience.

Lately, some empirical findings suggest that self-efficacy can be detrimental for solving certain problems (Vancouver, Thompson, Tischner, & Putka, 2001). That is, in some cases, high self-efficacy may lead to over-confidence, which contribute to low performance. The task used was designed to be mostly a trial-and-error problem combined with analytic reasoning (i.e., Mastermind), where added effort is useless initially, and the demands on mental hypothesis testing are high. In particular, with high self-efficacy, and thereby increased belief that one is competent in a task, it may lower one's willingness to doubt earlier incorrect conclusions, therefore leading to poorer performance. Thus, self-efficacy is detrimental to performance in tasks where self-doubt is critical, and when effort is not that important for performance. However, as self-doubt is contrasted with self-efficacy, it is not surprising that tasks focusing on the importance of self-doubt are negatively affected by self-efficacy (Bandura & Locke, 2003).

Although self-efficacy has been measured by subjective ratings in many countries and contexts (Sholz, Doña, Sud, & Schwarzer, 2002) where these ratings are typically correlated to academic performance or behavioral change (see Zimmerman, 2000, for a review), self-efficacy also allows experimental induction. Self-efficacy can be induced by false feedback of excellent performance (personal attainment), letting peers complete tasks (vicarious experience), or verbal persuasion. However, as evident in the self-determination research, verbal persuasion such as praise

is probably the least effective, and may even be counter-productive (Henderlong & Lepper, 2002).

Self-efficacy has been related to memory performance a few times (Klein, Loftus, & Fricker, 1994). (Studies concerning self-efficacy through goal-setting and memory performance (West, Welch, & Thorn, 2001; West, Welch, & Bagwell, 2003) are reviewed in the next section on goal-setting.) Klein et al. (1994) used a very clever self-efficacy instruction: false feedback on general memory skill. Participants conducted two tests, the first of which was a very difficult recognition task with small possibilities for the participants to know whether they performed well or not. Then, randomly chosen participants were told that they were particularly good memory performers (top 6%), whereas others were told that they were in the top 54% performers or told nothing at all. The results showed that high self-efficacy participants showed greater hypermnesia in only two trials than non-instruction and low self-efficacy. Hypermnesia is the phenomenon where several test trials in remembering sometimes provide increased memory performance (Payne, 1987; Payne, Hembrooke, & Anastasi, 1993). That is, when tested repeatedly, the losses (items that are forgotten) are fewer than gains (items that are added) in subsequent trials. To repeatedly try to retrieve a set of items within a short time frame what has only been encoded once is a very specific task, and not particularly common in everyday life. However, in a more conservative view of episodic memory performance, hypermnesia is not a traditional measure of memory performance. Sadly, the data analysis did not allow any statistical inference if the motivator increased the performance in the first trial, which would be a more clear recall performance measure. Thus, the results of the study are limited to hypermnesia.

Goal-setting

Goal setting is a theory that emphasizes a person's drive to reach a designated end-state, which itself is regarded as pleasurable by the individual. It could be a long-term goal such as attaining an academic degree, or a short-term goal like getting the next meal. Goal-setting is affected by specificity, proximity, and difficulty. An ideal goal would be objective and easily quantified, close in time and effort, and moderately difficult so that it challenges a person. Clearly, the most difficult aspect to administer experimentally is difficulty in goal-setting. People perceive the same task very differently in terms of difficulty, and a task that is challenging for some may be trivial for others. A goal should neither be set too high or low. The efficiency of goals is characterized in four major ways, namely, direction, energizing, persistence, and activation of previous

skills (Locke & Latham, 2002). The effect of direction is added focus on relevant goal-related things and the ignoring of irrelevant matters. Energizing is the added effort present when facing challenging (high) goals in terms of subjective ratings and repetition. Working intensively for a short period of time, or working slowly for a long time is also affected by goals. The adoption of previous relevant skills and knowledge are also more prominent in goal-directed behavior.

In goal setting, past research has also concerned type of goal. For instance, the goal to learn (learning goal) something is inherently different than performing a certain task (performance goals). Learning goals, also called task goals and mastery goals, refer to the desire to increase knowledge or develop skills, whereas performance goals (called ego-involved goals) refer to confirm one's knowledge or skill. It could also effectively mean covering up inability or ignorance. Both types of goals have been successful in predicting learning performance or academic achievement, regardless if the goal had been decided by experimenters (e.g., Graham & Golan, 1991), or set by the learners themselves (e.g., Greene & Miller, 1996). A recent clarification of goals and their effects on academic performance and motivation found that learning goals predicted better coping, persistent motivation, and better performance when challenged, whereas performance goals predicted effort reduction and decreased performance (Grant & Dweck, 2003).

In terms of experimental manipulation, goal setting is a very flexible theory, as goals can easily be tested both quantitatively by varying the goal difficulty, and qualitatively by comparing different goal orientations (e.g., learning vs. performance goals). Measurements of goal setting are often conducted in synchrony with other motivational theories, such as self-efficacy (West, Welch, & Thorn, 2001) or self-determination (Elliot & Harackiewicz, 1994). Furthermore, goal orientation counterbalanced with task consistency affected intrinsic motivation and self-efficacy similarly in that learning goal participants were more motivated when performing an inconsistent task, whereas performance goal participants preferred a consistent task (Steele-Johnson, Beauregard, Hoover, & Schmidt, 2000).

West, Welch, and Thorn (2001) investigated the effect of goal setting on shopping list recall performance using young and old participants. The participants were tested in four trials, one before goal setting instruction, and three after. Goal setting was induced in simple goal setting (i.e., setting a proportion of correct recall) and goal setting with feedback. The results showed an interaction between goal setting and trial for young adults. That is, both goal setting conditions showed greater improvement from baseline to final trial, compared to no-goal

condition. For older adults, this pattern only occurred for the goal without feedback condition. In the goal with feedback condition, there was a tendency towards decreased performance.

This age difference can be explained in terms of self-determination theory (Deci & Ryan, 1985), in the sense the feedback and praise (Henderlong & Lepper, 2002) may be experienced both beneficially and malignantly. The older adults chose to set lower goals than young adults, which could reflect greater insecurity in their memory capabilities. Combining this lack of confidence with feedback that they did not successfully reach their own goal may cause a very low level of self-efficacy, and limited effort in subsequent trials.

The notion that goal setting only improved recall performance between baseline and final trial somewhat dims the clarity of the effect. For instance, why did not goal setting improve performance in the first trial after goal-setting instruction? It could be the case that goal setting improved the application of memory techniques over several trials, which is different from direct memory performance. Nonetheless, goal-setting is a promising framework to affect memory performance (West et al, 2001).

Furthermore, studies that have compared mastery goals and performance goals on working memory capacity in mathematic problem solving found that mastery goals were positively correlated with working memory, whereas performance goals were not (Linnenbrink, Ryan, & Pintrich, 1999). Probably, negative affect and distracting thoughts were mediating this pattern so that performance goals were associated with higher levels of anxiety (Linnenbrink et al, 1999).

Social influence

The social influence framework of motivation preys on the fact that people often wish to conform to group standards. In a classic social psychology experiment, people subjected to group pressure to judge the relative length of a line tend to trust their comrades rather than their own perception (Asch, 1956, see also Bond & Smith, 1996). Three major types of social influence can be used as a motivator, namely, stereotype threat, ego-threat, and arbitrary group standard threats.

Stereotype threats threaten that an individual might not perform up to the standards in relation to subject variables such as gender, age, or ethnic origin. In other words, one can motivate participants by truthfully or falsely claiming that their particular group is generally performing very well or very poorly in the upcoming task. Performance in everyday memory has been investigated as a function of gender stereotype threat (Colley, Ball, Kirby, Harvey, & Vingelen, 2002). The results showed that

the general notion that women perform better than men in episodic memory performance can be minimized as a consequence of stereotype threats. In contrast, stereotype threats can have a negative influence on working memory capacity (concentration), presumably through negative affect (Linnenbrink, Ryan, & Pintrich, 1999).

Another way to impose social influence on participants to perform more efficiently is ego-threatening. Graham and Golan (1991) compared the effects of mastery goals and ego-involving goals in terms of recall performance in deep levels of processes. The results revealed that the ego-involved children performed significantly worse in recall, particularly when the motivator was presented after study but prior to test. Furthermore, the ego-involved condition children performed worse than control condition children, which was equal to mastery instruction. This study is a good example where a motivational instruction can be detrimental for memory performance, which can be expected in terms of the aforementioned self-determination theory.

Recently, Reysen (2003) investigated the effects of pressure to perform as well as others in a recall task. The elegance of this study was the notion that conformity pressure was experimentally administered during the test phase. Participants were tested separately, but within a perceived group, and recall items were to be written down on a computer screen together. High-goal condition participants had teammates that were good performers. That is, while writing, the participants could see that his or her team mates remembered 8-10 words together over several trials, whereas the low-goal condition participants had team mates that remembered 4-6 items. The results showed that high-goal participants performed significantly better than low-goal participants, as well as a control condition. This arbitrary group standard threat is also much easier to administer in terms of experimental designs, as ego and stereotype threats are more heavily dependent on the participants' relations to their categories or selves. Although this study is regarded as a study of conformity pressure, there is a plausible alternative interpretation of the induction. Imagine sitting in front of computer screen watching teammates perform fairly well. In terms of self-efficacy, this is a vicarious experience. Seeing others perform successfully can sometimes cause people to believe that they too can perform at equal level. This alternative explanation supports the notion that self-efficacy is the most successful motivational theory to affect episodic memory performance.

Despite the fairly clear conceptual difference between self-efficacy and related theories on effect and theoretical foundation, there is a problem of flexibility. There are so many closely-related ideas, particularly

those emphasizing social influence, causing confusion in understanding the results theoretically. The Reysen (2003) study is a good example that when a new experimental motivator is used, the results can be explained in many motivational ideas or theories. The reason why this occurs is because many influential motivational theories are inherently quite similar, or are often measured, as opposed to induced, in their respective studies. In this situation, there are two major paths to follow. First, a conservative view which suggests that each concept is intimately connected to the previous methods used, and that deviations should be viewed as motivators that induce something else. A consequence of this is that a multitude of closely related theories are developed, and become increasingly more similar. A more liberal view is to consider a new manipulation as inducing motivation which adopts an eclectic view. That is, the new operationalization is a conglomerate of existing motivational theories, without the aim to create a new motivational theory. Consequently, this approach increases the conceptual complexity, at least from a practical point of view, but it has the distinct advantage of potentially creating more powerful motivators. The present thesis, with the exception of Study I, followed the latter of these two paths.

RESEARCH OBJECTIVES

Past research suggests that motivational effects on memory performance are minimal (e.g., Nilsson, 1987). More importantly, there are very few empirically grounded ideas on how motivation would improve or deteriorate episodic memory performance (see Graham & Golan, 1991). These problems are probably a practical consequence of a poor conceptual structure in motivational psychology. Even if two different ideas on motivation had clearly different conceptual bases, then the operationalization of motivation from different theories could be similar, or even indistinguishable in certain experimental settings (Reysen, 2003). Thus, the problems discussed throughout the empirical studies are more focused on motivation than on basic memory functions. The general outline of the thesis work was to first identify one or several motivators that actually affect episodic memory performance. Furthermore, the motivators were limited to those manipulations that aimed to improve participants' memory performances, as opposed to inhibiting motivators, which probably can be induced in a trivial sense (e.g., creating a memory game where successful recall is penalized). Ideally, the motivational inductions would improve performance compared to a neutral instruction.

Provided that these potential effects could be demonstrated (i.e., that motivation actually affects memory performance), the second aim was to clarify the underlying mechanisms of these motivational effects. Thirdly, assuming that efficient motivators can be identified, and the mechanisms explained, then the motivators themselves could be related to existing motivational theories, and possibly substantiate or invalidate some motivational theories. However, relating empirically driven motivators to theoretical accounts may lead to stretching the limits of already well-defined motivational concepts.

From a historic perspective, Study I used a typical hedonistic motivator (i.e., competition reward), whereas Study II examined two motivators within the voluntarism framework (i.e., stereotype threat and goal setting). Studies III and IV aimed to combine the two philosophical perspectives by manipulating the chance of winning in the reward competition and by using different competition formats (i.e., team and individual competition). In Studies II, III, and IV, the motivators are not easily categorized in traditional motivational psychology. However, to search something unexplored often warrants unconventional methods, and some motivational theories do not suggest how to induce motivation as opposed to assess motivation (e.g., self-determination theory).

SUMMARY OF EMPIRICAL STUDIES

Study I: Item-specific bias, self-rated motivation and memory performance

Although a massive amount of research has been conducted on motivation and memory independently of each other, the number of studies concerning the relation between them is scarce. Furthermore, some previous studies are limited due to methodological weaknesses (e.g., Weiner, 1966). Study I concerns mainly empirical issues as opposed to theoretical advances. The motivator used in the present study, reward competition, is based in hedonism, but it only captures the pleasure aspect of hedonism. That is, competing to get a small monetary reward is a pursuit of a minor pleasure, but it has no real implied avoidance of pain. Should the motivator imply a reward for competition victory, and imply pain for not winning, then the whole scope of hedonism would be encompassed in the motivator. Therefore, the motivator used in the present study is indirectly focused on the search for pleasure.

Previous research has also been very limited in the memory tasks used, and one possible reason why few studies have reported effects of motivation could be usage of insensitive measures of memory performance. To expand the variety of dependent measures of episodic memory performance used in previous research, Study I included a source recall task in a second experiment. Source memory is a special case of episodic memory, and it deals with the origin of a previously experienced episode (Johnson, Hashtroudi, & Lindsay, 1993). Source memory refers to the context where a certain knowledge acquisition took place, whereas item memory is the memory of the often central information of content. Item memory would be to know that the capital of Argentina is called Buenos Aires. However, if you try to remember who taught you that, where you heard it for the first time, what clothes you were wearing at the time, or the emotional state of your informer, then you would be dealing with source information. Generally, source remembering is more difficult than item remembering. This is evident in aging research, where aging seems to impair source memory to a greater extent than item memory in both recall (Erngrund, Mäntylä, & Nilsson, 1996) and recognition (Frieske & Park, 1999). Provided that source recall is a more sensitive measure than item recall, motivational effects were expected to be accentuated in source recall.

Another methodological limitation of past research is its lack of control for item-specific biases in encoding or retrieval. Consider a

memory task that includes, for example, remembering blue and green words. Participants are instructed that they will receive a monetary reward only for each blue word. Unsurprisingly, people remember more blue words than green words (see Baddeley, 1990, for an equivalent thought experiment). However, the overall performance is most likely not improved by the incentive, as what is gained on the blue words is lost on the green words.

Several studies have reported this self-evident pattern of results (Eysenck & Eysenck, 1982; Heinrich, 1969; Weiner, 1966). Weiner (1966) reported this effect for both reward and punishments (i.e., people remember items associated with large shocks better than those associated with small shocks or incentives). This item-specific bias can occur in both encoding and storage. In the blue and green words example, there is a great likelihood that participants will simply ignore the green words, and heavily focus on the blue words during encoding. Loftus (1972) registered participants' eye movements when they viewed picture pairs. One of the pictures in each pair was associated with an incentive. The eye movement data showed that participants were looking more closely on the incentive-associated pictures than the neutral picture, and recognized them better. Furthermore, when eye movements were accounted for, the differences in recognition were eliminated.

One straightforward way to avoid item-specific bias in encoding is to use a between-subjects design. That is, if two different groups (i.e., high vs. low motivation) are compared in memory performance, then item-specific encoding is eliminated as a possible explanation of the results. Item-specific biases in storage may also occur, as highly motivated participants might rehearse the studied items more than less motivated participants do. Using a memory task with an immediate test would minimize item-specific bias in storage. In Study I (and in Studies II-IV), both countermeasures to minimize item-specific biases were adopted.

Study I also aimed to examine the impact of reward competition on subjective ratings of intrinsic and extrinsic motivation. After all, if a motivator fails to affect episodic performance, there are at least two possible inseparable conclusions that can be drawn from the data; (a) motivation does not affect episodic memory performance, or (b) the manipulation was not powerful enough to affect memory performance. Past research on competition motivation and episodic memory performance has shown that non-competition participants believe that they would perform better had they been in competition, but in fact, they perform at equal level as competition participants (Nilsson, 1987). One weakness in this study is that the participants revealed their thoughts

about being in the other condition after they had conducted the memory task, and that the statement can also be a metamemorial beliefs statement about their beliefs about their own hypothetical performance. Study I involved a more explicit assessment of subjective motivation in that it measured motivation both before and after induction, but before study.

Study I involved the self-determination theory as a framework for assessing participants' subjective reports of motivation. Of particular interest was to measure both intrinsic and extrinsic motivation, because of the previously reported detrimental effect of competition on intrinsic motivation (Deci, Betley, Kahle, Abrams, & Porac, 1981). Unfortunately, most scales of intrinsic motivation, such as the Situational Motivational Scale (Guay, Vallerand, & Blanchard, 2000), and experimental studies (e.g., Deci, 1971) tend to measure the motives of an action after the action has been performed, or when it is being performed, as opposed to measuring *future* actions which the present study intended to do. Therefore, a different approach for measuring intrinsic and extrinsic motivation was used in Study I. Specifically, the concepts of intrinsic and extrinsic motivation were first clarified, and then the participants rated their own levels of motivation in both types.

Taken together, the overall aim of Study I was to investigate the relation between reward competition and episodic memory performance. Specifically, the present study had three aims to further advance the field, namely, (a) increasing the sensitivity of the dependent measures by including a source recall task, (b) examining participants' experienced level of motivation as a cause of the motivator, and (c) minimizing item-specific biases.

The subjective ratings data showed a higher level of extrinsic motivation in the competition condition than in the no-competition condition. In contrast, reward competition had no significant effect on actual memory performance, measured in item and source recall, and item recognition. This pattern of results solidifies the notion that motivation in terms of competition does not affect memory performance, when item-specific biases are minimized (Nilsson, 1987).

In conclusion, Study I is consistent with the notion that episodic memory performance is relatively impervious to motivational manipulations, and that competition only increased self-rated extrinsic motivation, which may be detrimental to a variety of performance tasks (see Deci, Ryan, & Koestner, 1999, for a meta-analysis). Furthermore, the augmentation for extrinsic motivation could stem from participants' acknowledgement that they have understood the instruction, rather than higher experienced extrinsic motivation. That is, the motivational

induction was so obvious that many competition condition participants may have rated higher levels of extrinsic motivation because they felt expected to do so, despite not actually experiencing higher extrinsic motivation. However, this problem is very hard to overcome when measuring motivation before and after motivational instruction.

Presuming that the ratings are valid, Study I showed a dissociation between extrinsic motivation and episodic memory performance. This dissociation probably has its origin in metamemory. As evident in previous studies (Nilsson, 1987), people think that they would perform better in episodic memory tasks if they were more motivated. However, this common belief is probably more accurate in prospective memory (Meacham & Singer, 1977). Furthermore, people may not differentiate between overall increased performance and item-specific biased performance. These factors might contribute to the popular belief that motivation improves memory performance in general.

Although minimal effects of motivation were obtained in Study I, suggesting that reward competition (hedonism) alone cannot influence memory performance, a possibility exists that such effects are obtained by using a different theoretical ground in the motivational induction. In Study II, voluntarism ideas (i.e., goal setting and stereotype threat) were used as the motivators.

Study II: Ego-involved goal setting and memory performance

Motivators based in hedonism rarely account for how a thinking individual actually regards a reward, or if a competition is stimulating in its format. In contrast, motivators stemming from voluntarism are almost exclusively using the self in their functions. Some of these ideas have produced theories that have some reported influence on memory performance, namely, ego vs. mastery-involvement (Graham & Golan, 1991), and goal-setting (West, Thorn, & Bagwell, 2003; West, Welch, & Thorn, 2001). Furthermore, reward as a motivator has shown to be insufficient to affect episodic performance (Nilsson, 1987; Study I). Possibly, motivators stemming from voluntarism might be more successful. Therefore, Study II aimed to adopt two ideas based in voluntarism to motivate the participants, namely, ego-involvement and goal-setting with the same procedure as Study I did, including self-reports on intrinsic and extrinsic motivation.

Ego-threats challenge the self, where the instruction aims to induce a personal demand to perform at a certain level. The demand occurs if the

participants themselves feel threatened in one aspect of their identity. Should the instruction aim at an aspect that the participants do not consider as an integral part of their identities, the motivator is weakened considerably. Furthermore, ego-involvement can also be induced by references to previous performances in tasks with several similar trials. Generally, ego-involvement, particularly when contrasted with mastery goals, is considered detrimental for performance. For instance, ego-involvement appeared to have a detrimental effect on children's memory performance under deeper levels of processing (Graham & Golan, 1991). Study II aimed to combine ego-involvement (stereotype threat) and goal setting, which both showed some impact on episodic memory performance in earlier studies (Graham & Golan, 1991; West, Welch, & Thorn, 2001).

Ego-involvement was induced by presenting a summary in table format of mean memory performance scores from previous experiments, categorized in several aspects, namely, age, gender, and faculty. The scores presented the participants as worse in performance compared to others. For example, male computer science students were informed that art students and females were better in memory performance than computer science students and males, respectively.

Goal setting was manipulated by setting the numbers in the summary table at a generally high or average performance level. The average level was the same as a control condition performed in a previous experiment, whereas the high level was set at one standard deviation higher. Presumably, participants would read the summary, and aim to at least perform at an average level or better.

The results showed that neither goal nor ego-involvement had any impact on episodic memory performance. This pattern is similar to that reported in previous research (West et al, 2001) in the sense that goal setting did not improve episodic memory performance in the first or only trial. In contrast to Graham and Golan's (1991) findings, where the ego-involvement group performed significantly worse than the control group, ego-involvement was numerically better in Study II. Probably, methodological differences between the two studies can explain this pattern. Furthermore, the subjective ratings results showed that the participants were relatively unaffected by the motivator.

Graham and Golan (1991) induced ego-involvement by referring to previous tasks, whereas Study II involved a comparison between personal traits. The motivator adopted in Study II is better characterized as form of stereotype threat, which in turn has recently been showed to improve performance in everyday memory tasks (Colley, Ball, Kirby, Harvey, &

Vingelen, 2002). Thus, it could be the case that stereotype threat has ameliorating effects, whereas ego-involvement is more likely to have detrimental effects. In addition, children are probably more susceptible to motivational manipulations than adults, and the memory tasks were different as well.

In a more general sense, the lack of effects in Studies I and II, indicated that episodic memory performance is not easily affected by motivational manipulations. However, in terms of historic ideas of motivation, the motivator used in Study I originates from hedonism, and the goal and stereotype threat adopted in Study II is based in voluntarism. Possibly, a motivator that combines these two main streams of conceptions would be more efficient.

Study III: Motivation and memory: Chance of winning in social and individual recall competition

Motivation in past research has generally been induced individually, which is perfectly in line with hedonism that emphasizes the organism's pursuit of pleasure. However, this is a limitation in previous research that motivators aimed at groups may be more successful than those aimed at individuals, and that this limitation might explain the scarcity of motivational effects. Furthermore, a group motivator also affects the self in each individual participant. Competing in a team is different than competing alone in terms of pressure and self-worth.

A social psychology phenomenon, the discontinuity effect (Pemberton, Insko, & Schopler, 1996; Schopler, Insko, Wieselquist, Pemberton, Witcher, Kozar, et al., 2001; Wildschut, Insko, & Gaertner, 2002), refers to the notion that competition between groups tends to be more aggressive than competition between individuals. This effect should improve the motivational power of a competition instruction.

Research in collaborative inhibition has provided some support that team-oriented motivators affect memory performance. Weldon, Blair, and Huebsch (2000) tested the hypothesis that the detrimental effect of cooperative recollection with others could be explained in terms of motivational effects. The participants were tested in teams, either cooperating with each other, or individually, as well as competing for a reward or not. The results showed that reward competition did not minimize collaborative inhibition, but that reward improved recall performance. However, the results were analyzed nominally. That is, one condition recalled items together on a common list, and another recalled

items separately but all redundant words were removed to create a single list. Usually, the separate individuals perform better than a co-operating group (e.g., Weldon, & Bellinger, 1997). Although the fact that the influence from peers or instructors has been stressed as an important factor in many theories (e.g., self-determination theory, conformity pressure), group processes have not been a prevalent factor in research on motivation and memory performance. Therefore, Study III extended the reward competition instruction by including a group manipulation. Specifically, the group condition was designed to imbue participants with as much sense of belonging in a group as possible. There are at least three factors that can be manipulated in the sense of being in a group. First, the participants in the same group should be able to see each other during the experiment, believing that they are competing against other groups. Unless this criterion is upheld, participants may distrust his or her membership in the group or simply believe that group does not exist altogether. Second, the reward, in case of a victorious performance in the memory competition should be shared together as one unit among the members, as opposed to a reward easily dividable into pieces to be distributed equally among the group members. If the reward is dividable, then there is a chance that a participant may feel that he or she is simply competing to get his or her fair share of the reward, with no particular caring about the other in the group, except for their performance. Third, collaboration during the test would also strengthen the sense of being in a group. However, this would probably cause the collaborative inhibition that Weldon et al. (2000) aimed to minimize by motivational instructions. Therefore, this was not used in the study, though the participants were tested together in their respective condition. For all practical purposes, the materials and procedure was identical to those of Studies I and II.

The results revealed a significant effect on recall performance favoring group competition over individual competition. Thus, the insertion of group processes enabled the competition instruction to improve episodic memory performance. Consequently, Study III suggests that there are motivational effects on episodic memory performance, an exceptional finding considering previous research.

For practical reasons, the participants were tested in four groups. One group received the group competition instruction, and one received the individual competition instruction, and the two other groups received a control instruction. In this arrangement, it is possible that the participants in the group condition participants assumed that they were competing against the three other conditions. If so, their statistical chance

of winning would be .25. In contrast, the participants in the individual condition had two interpretations of their statistical chance; three individual winners from their particular session, or three winners from all participants in the entire experiment. Either way, participants in the individual condition may have believed that their chances were considerably lower than .25.

Following this line of reasoning, another experiment was conducted whereby the statistical chance was explicitly stated in the competition instruction. Furthermore, in effort to design a more stringent experiment, the reward was kept the same for the individual and group conditions (i.e., monetary), as well as the condition of ignorance about potential group members and co-competitors. That is, the group condition participants were not informed who their group members were, and the individual condition participants were also unaware who their competitors were in the session. Experiment 2 used a 2 x 2 design, with high and low statistical chance to winning, and group/individual competition as between-subjects variables.

The results indicated a main effect of chance of winning, and planned comparisons showed that chance of winning was most effective in the team competition conditions. Taken together, the results of Experiment 1 and 2 can be interpreted in favor of group processes and chance of winning. The case for group processes is that when the instruction and reward were designed to be more socially oriented (which was the case in Experiment 1 compared to Experiment 2), the results from Experiment 1 showed that group processes facilitated memory performance. However, when the emphasis on groups was greatly reduced, the effects disappeared in Experiment 2. Support for a chance of winning account is straight-forward, in that episodic memory performance was ameliorated. Hence, chance of winning should be regarded as an important mediator of episodic memory performance.

The data in Study III does not allow a clear separation of group processes and chance of winning. Therefore, it is possible that both influences are efficient to affect episodic memory performance. However, the results are based on only two experiments, and further examination on the relation between group processes and chance of winning is needed. Furthermore, the findings are solely based on experiments on male participants. Thus, a natural continuation of Study III was to include female participants in a similar study.

Study IV: Motivational effects on memory performance: Chance of winning, group structure, and gender

In contrast to Studies I and II, Study III showed that motivators reflecting components of hedonism (competition reward) and voluntarism (group processes) can affect episodic memory performance. The aim of Study IV was to replicate and extend the findings in Study III, by examining motivational effects in relation to gender. It aimed to determine if the same motivators were efficient in motivating females as well as males. Thus, apart from the gender factor, Studies III and IV were identical in aim and procedure.

As shown in the figure (see manuscript), the results revealed a significant main effect of gender favoring females over males. Furthermore, the gender effect was mediated by an interaction between gender, chance of winning, and group structure. A separate analysis on the data from male participants showed a significant interaction between chance of winning and group structure, and a tendency to favor group competition. Corresponding analyses for females revealed no reliable effects.

The notion that females often perform better than males in episodic memory tasks is well-known in previous research (e.g., Herlitz, Nilsson, & Bäckman, 1997), and is replicated in Study IV. However, recent studies in everyday memory have found that motivation sometimes can minimize these differences (Colley et al, 2002). However, when dealing with subject variables, it is advisable to be cautious when drawing conclusions. Similar to Study III, Study IV suggests that both group processes and chance of winning are important components in competition motivators.

Group processes seemed to be different for males and females. In the high chance conditions, performance was facilitated by group competition males, whereas females appeared to favor individual competition. However, these preferences alone were not strong enough to yield reliable effects, as an interaction occurred but no main effects.

In terms of chance of winning, it is noteworthy that group effects were only evident in the high chance of winning conditions. A plausible explanation for this is that the presence of high chance of winning is a necessary factor for the team competition conditions. For instance, a participant in the low chance of winning condition might not care if there is a group or individual competition because the chances of winning are so minimal. However, when there is a substantial chance to win, group

competition is less pressuring on the participant's own performance. As presented in the figure (see manuscript) males in the high – individual condition performed slightly worse than both the low chance of winning conditions. This pattern suggests that individual competition with high chance of winning may also have detrimental effects for males. As mentioned before (see the self-determination section), motivators can be experienced as somewhat controlling, and thereby less motivating. Alternatively, the importance of the situation for a motivated participant may cause choking under pressure (Baumeister, 1984), which in turn can explain the small decrement in memory performance.

The findings in Study IV are similar to those of Colley et al. (2002) in the sense that a motivational instruction can boost males to perform at an equal level to that of females. However, given the data, it is not possible to infer that group processes and chance of winning are not motivating for females per se, or whether high performers are not affected by the motivators.

Taken together, group processes, chance of winning, and gender form a complex relation to episodic memory performance, where males appear to be more susceptible to the differences in group processes and chance of winning in small, facilitative, and detrimental ways. Furthermore, Study IV solidifies the notion that episodic memory performance can be mediated by powerful motivators.

RELATION BETWEEN MOTIVATION AND MEMORY

This chapter discusses the relation between motivation and memory performance from a more theoretical point of view, as opposed to the more empirical approach presented in the motivation section. Due to inconsistent results in the field, some of these ideas are mutually exclusive, whereas others are perfectly applicable together. The section is divided into three subsections that each account for a particular pattern of results, namely, (a) changes in activation level in mental representation, (b) mediation through strategies, and (c) internal conflict. These three notions are first summarized in this section, and then more extensively explained.

The notion of activation shifts of mental representations assumes that the representation of motivation-associated memories is more readily accessible compared to neutral memories. Subsequently, motivated individuals may not necessarily perform better in terms of the number of recalled items, but instead show faster response latencies in recognition tasks. Similar to the idea grounded in Study I, this notion suggests that motivation does affect memory performance, but the dependent measures are too insensitive to detect the effect.

Mediation by memory strategies suggests that motivation affects memory encoding or retrieval separately. That is, motivated individuals may adopt more demanding, but efficient, memory techniques during the study of the stimulus items, and thereby improve performance. Alternatively, highly motivated participants might expend more effort during retrieval, trying to suggest more potential items that may or may not have been present in the stimulus material. The latter notion relies heavily on the distinction between recall and recognition.

Internal conflict is based more on motivational processes compared to the aforementioned more cognitive explanations, and aims to explain why motivation in many cases does not affect episodic memory performance. The idea is that many motivators send the participants mixed messages. Motivators almost invariably encourage more effort. However, in many cases they imply that there are other things to think about, which causes an increased level of detrimental self-awareness and distraction. Thus, many motivators bring both negative and positive stimuli, which in turn cancel each other out.

Activity level in mental representation

Intentional superiority effect

The relation between intention and motivation should be very integrated. In Geen's (1995) general definition of motivation, initiation of behavior is included, which suggests that the intention of a certain action is included in the concept of motivation. Some studies concerning intention have focused on the prospective dimension of memory (Goschke & Kuhl, 1993). That is, to keep in mind that one is supposed to do something in the future. Goschke and Kuhl (1993) investigated the differences between three types of scripts. Each script was associated with an instruction, namely, perform, observe, or be neutral. The perform instruction meant actually performing the series of actions presented in the script in the future, the observe instruction meant simply watching someone else performing the actions, and the neutral instruction meant no action. The participants were instructed to memorize two scripts for a subsequent recognition test. Prior to the test, the participants were instructed to either execute or observe one of the two scripts after the test, and one was not associated with action or observation. The results showed that the response latencies were significantly lower for words from the script to be executed compared to words from the neutral script, whereas words from scripts to be observed were at equal level to those from a neutral list. This result, particularly the difference between execute and neutral scripts, was interpreted in terms of higher level of activation. That is, things that people are supposed to perform in the near future are represented in the mind at a more ready level to enact (Goschke & Kuhl, 1993). This intentional superiority effect has also been shown in lexical decision tasks (Marsh, Hicks, & Bink, 1998), and an alternative explanation, action superiority effect, has been put forth recently (Freeman & Ellis, 2003).

The close relation between intention and motivation poses a question on whether there is a similar effect caused by motivation. That is, if one script is associated with an incentive (or any other motivator for that matter) instead of an intention instruction, would the same pattern of results occur? If the same results would occur, then the higher level of activation is explained by item-specific biases in rehearsal. However, the presentation of which script that should be executed was presented only two seconds before the recognition. Then again, two seconds of rehearsal might be just enough to create the small differences in response latencies that the intentional superiority effect is based on. In order to avoid this, a between-subjects design would be preferable, where one condition is recognizing words from a previously learnt script associated with a

motivator, and the other is doing the same thing without motivator. This would investigate whether there is a motivational superiority effect. Presumably, the notion of changes in activation levels in mental representations as a function of motivation could also explain the difficulty in affecting memory performance. That is, changes in levels of activation might not be discovered in performance measures because the differences are too small.

Mediation through strategies

Efficient encoding

Past research in mnemonics shows that the adoption of memory strategies is more effective when presented before studying the stimulus material than after. Assuming that all participants are able to adopt at least one memory strategy during the encoding phase in a given episodic memory task, it is plausible to suspect that more motivated participants choose to use their strategies to a greater extent than their less motivated peers. Alternatively, effective memory strategies are sometimes more demanding than less effective techniques and motivated participants might choose to use a more effortful mnemonic than others. In both cases, motivation should improve episodic memory performance during the encoding phase. Furthermore, if this idea is true, then motivational effects should be more prevalent in studies whose memory tasks present opportunity to adopt memory strategies. However, the validity of the notion is debatable. Graham and Golan's (1991) study found that the impact of motivation was only evident in deeper levels of processing, which suggests that encoding is important. Furthermore, when a sequence of highly imaginable nouns was used, repeated tests showed that self-efficacy improved hypermnesia (Klein et al, 1996). In contrast, when less imaginable word lists were used, the motivation did not affect memory performance (Study I; Nilsson, 1987). Granted, the motivators and dependent measures of memory were different which may explain the differences in results. Nonetheless, the importance of encoding in the study phase cannot be removed as possible factor to explain the inconsistencies in the field.

If motivation has effects on memory encoding, then the choice of memory tasks becomes an issue worthy of investigation. If the study phase involves a stimulus presentation where memory techniques can be used more efficiently (e.g., highly imaginable words, presenting all items at the same time), then the chances are probably increased for motivation to affect episodic memory performance. However, this is probably not a

necessary factor for motivation to affect memory performance (Graham & Golan, 1991), but more an aiding circumstance.

Persistent retrieval

A critical distinction in memory research is the contrast of familiarity and recollection. Familiarity is the case when someone can recognize something without being able to place the object of recognition in a clear context. A classic example is when you recognize someone, but you are unable to present any information about the event that must have taken place when you saw him or her. However, this does not imply that uncertainty is associated with familiarity, as one can be very sure that one has seen someone before. Familiarity is usually measured in recognition tasks, where participants are presented with a set of stimulus items and then are asked to identify these old items among a set of new items. In contrast, recollection refers to the often-vivid memory of an event that has been experienced in the past. In the memory laboratory, recollection is measured in different types of recall, where participants are presented a set of stimulus items (e.g., words), and later instructed to write down as many items as possible in free or serial order. In comparison, recognition is much faster than recollection, less sensitive to brain injury, and the ratio Hits-False Alarms show different patterns (see Yonelinas, 2002, for a review). In order to explain these differences, early theorists suggested that recall consists of a search process and a process that chooses to decide whether the found memory trace is applicable in the present context. In recognition, where the task is to decide whether an item is old or new, the first process is not needed. Presumably, this would explain the differences in performance. However, this notion is not entirely accurate because sometimes cued recall is better than recognition, which should not be possible according to two-process ideas (Muter, 1978). Furthermore, there are similarities between recall and recognition, in relation to contextual influences (Tulving, 1983). Tulving's principle of encoding specificity is affecting both recall and recognition. The frequent superiority of recognition is explained in terms of greater informational overlap between encoding and retrieval in recognition, and in that recall is more demanding in overlap in order to be successful. Thus, recall demands the identification of a previous event and judging familiarity, whereas recognition only requires the decision making process of familiarity.

Persistent retrieval is the idea that motivated participants generate more possible items from the study materials. By doing so, they cause a recall task to become more like a recognition task. For example, if a list of nouns is to be remembered, a motivated participant can simply write

down many possible items on his or her sheet and then determine whether the word was presented or not on the study list. A similar strategy would be to imagine several words mentally, and then decide. Thus, persistent retrieval assumes that it is the generation process that is subjected to motivational influences. If this notion is the principal explanation how motivation affects memory performance, then motivational induction should affect recall but not recognition, or at least, recognition tasks should be more impervious to motivational effects than recall.

In Study III, chance of winning proved to affect episodic recall performance, which suggests that the first objective of the thesis' empirical work producing an efficient motivator to affect episodic memory performance, is met. Consequently, the second objective, to explain the mechanisms through which motivation affects memory performance, was investigated in a supplementary experiment. The same motivator was used in a learning task, and a word recognition task. The learning task was reading an encyclopedia text on a small African nation (i.e., Benin) for 10 minutes. Immediately after the reading phase, the participants were instructed to answer twenty content multiple choice questions, where one of five suggested answers was correct. Following the learning task, the recognition task was to memorize forty nouns, identical to those used in Experiment 1, which were presented in two columns for three minutes. In order to minimize the chance that ceiling effects would occur, the words were written in one of four colors and the participants were instructed to remember the color associated with each noun. The results showed that neither learning nor recognition was affected by chance of winning. Furthermore, virtually all experiments showing effects of motivation on episodic memory performance have been using recall, both in this thesis (Studies III & IV), and in previous research (Graham & Golan, 1991; Reysen, 2003).

Hypermnnesia research also presents some converging indications that retrieval is the critical memory process for motivational manipulations (Klein et al., 1994). Most likely, hypermnnesia is a retrieval process, and if motivational instructions are affecting hypermnnesia, then memory retrieval is susceptible to motivational inductions.

Graham and Golan's (1991) study not only showed that ego-involvement reduced children's memory performance, but that the detrimental effect of ego-involvement was stronger when induced prior to test as opposed to induced prior to study. This pattern suggests that the retrieval phase is more susceptible to motivational inductions than the encoding phase. However, in this particular study, where motivation was detrimental to memory performance, the usefulness might be viewed as

somewhat trivial. If one presents information to a child that it doesn't help to try hard, or put any extra effort in the task, then it is very likely that the child would believe you and simply not try any more than the first couple of attempts. This is evident in the same study (Graham & Golan, 1991), as the mastery-oriented children did not outperform no-instruction children.

A classic study by Hyde and Jenkins (1973) also contributes to converging indications that retrieval, not encoding is the important memory process for motivation to have impact. They compared intentional learning (i.e., participants were instructed to learn a set of items for a subsequent test), with incidental learning (i.e., participants were simply told to watch a set of items), and reported that performance level was equal for intentional and incidental learning. Clearly, this manipulation is aimed at the encoding process solely, because when the test is presented for the incidental condition, the participants know that they are being tested and are supposed to perform their best. Consequently, the participants in both conditions are equally motivated during the retrieval phase, explaining why no difference between the conditions is reported in the study.

Another particularly telling example that retrieval is sensitive to motivational input is presented in a recent study on conformity pressure (Reysen, 2003). When presented with fictional co-participants during the retrieval phase, participants tended to be affected by their co-participants' performance, and their performance was better when their co-participants were good performers. Thus, it appears that motivational inductions aimed to affect retrieval are sufficient to improve episodic memory performance.

Study I emphasized that simply watching parts of the stimulus materials for a longer time would mean that the more encoded material is better recalled than the items watched for a shorter time. This is a trivial conclusion that one can infer from a thought experiment (Baddeley, 1991). In this vein, it is also plausible to suspect that motivational effects at the retrieval phase are trivial. That is, people who are more active during retrieval or are retrieving for a longer period of time will recall more than those who are less intensive in generating potential items or spend less time retrieving. Thus, the line of thought in the present thesis may be regarded (at first glance) as a double standard. However, there is a critical difference between memory encoding and retrieval that makes retrieval more interesting from a motivational point of view; consciousness. Directed involuntary exposure of something is very common in western societies, and it is fairly effective. Consider the notion

of listening to the radio which plays a song that you don't appreciate. No matter how un-motivated you are to learning the song, if you are exposed to it repeatedly, you are very likely to learn some of the lyrics, and recognize it in the future. In contrast, memory retrieval is more demanding in effort, particularly in recollection, and trickier in directly making people engage in it. In short, people are more likely to encode involuntarily than retrieve. Granted, an experimenter can instruct the participants to recall repeatedly (i.e., hypermnesia), and thereby account for the extra effort placed in motivated participants. However, this appears not to be sufficient, as past research indicated that hypermnesia itself improved as a function of motivation (Klein et al, 1994). Nonetheless, this criticism has some merit in the sense that the memory retrieval processes themselves may not be voluntarily activated, but motivational issues cause people to not want to share their recollective experiences. On the other hand, a motivated participant may adopt strategies to transform a recall task into a recognition task by more or less randomly generating possible items presented on the study list. Clearly, this strategy is a consequence of motivationally aided voluntary technique, and it has no direct corresponding function during encoding. Furthermore, item-specific bias indicates that overall performance is not improved, whereas persistent retrieving is.

Taken together, there is empirical evidence that retrieval is a critical component in motivation and episodic memory performance. However, there is the possibility that more motivated participants are trying for a longer period of time, or more intensively during the test phase. If this is true, then motivational inductions which improve recall performance should not be able to improve recognition.

Internal conflict hypothesis

As parts of previous studies and those of the present thesis show minimal effects of motivation on episodic memory performance (Nilsson, 1987; Studies I & II), it is important to conceptualize these null effects in theoretical terms. The notion is based on identical mechanisms as those in strategy mediation. That is, motivation can improve episodic memory retrieval by adopting memory strategies during the encoding phase, or by the exertion to generate potential items to be remembered during the retrieval phase.

Following the self-determination framework, a motivator can have both positive and negative influence, depending on whether the instruction is regarded as controlling or informing (Deci & Ryan, 1985). However, external rewards appear to be controlling most of the time.

Indeed, a recent meta-analysis (Deci, Koestner, & Ryan, 1999) argued that participants do feel less intrinsically motivated, and perform worse in a large number of tasks when under pressure from external rewards or extrinsically motivating instructions, including individual competition (Deci, Betley, Kahle, Abrams, & Porac, 1981). In addition, research on choking under pressure has found a consistent performance loss (Baumeister, 1984). The main explanation for this loss of performance is attentional shifts, either distracting on irrelevant stimulus, or self-awareness (Baumeister & Showers, 1986). Examples of negative effects of self-awareness can also be found in creativity research. In creative performance, thoughts on irrelevant matters or attention to unimportant stimulus characteristics might be beneficial, as originality is increased when two seemingly unrelated objects are related to each other. Yet, when students are explicitly told that their creativity is very important to their future writing career, creativity of poetry writing is decreased significantly (Amabile, 1985). Thus, external rewards that reduce intrinsic motivation can also affect performance, presumably by increased self-awareness in creativity, and problem solving. Hypothetically, the participants' situation is a conflict between the more effort they put down in the task and the increased pressure by being evaluated. Plausibly, this additional pressure is reduced when performing in a group. Thus, according to internal conflict hypothesis, any external rewards that include this pressure are not effective. Presumably, competing in a team removes some of that pressure that individual competitors suffer from as the accountability of the outcome is spread out on several competitors. If this is true, then instructions aimed to induce motivation by external rewards directed at individuals would yield lower or equal performance as controls. However, there is a likelihood that only the contrast between pressuring external rewards (e.g., individual competition) and less pressuring (e.g., team competition) would create an enough powerful difference in motivation to affect episodic memory performance.

CONCLUSIONS AND DISCUSSION

As a general rule in empirical sciences, there are limitations to consider when drawing conclusions, and this thesis is no exception from this rule. Throughout the progress of the present thesis, numerous researchers have asked why this motivational manipulation, that particular motivational theory, or these participants was ignored in the thesis. For many of these questions, there is a general answer. At the beginning of this work, the number of studies concerning motivation and episodic memory performance was very scarce. Subsequently, one had to start somewhere with a limited number of motivational theories to create motivators, group of participants, and memory performance measures. However, there are some topics that deserve to be addressed in more detail, namely, subjective ratings of motivation, motivational components, and gender issues.

The subjective ratings of motivation used in Study I were not developed as a general scale of intrinsic and extrinsic motivation for future tasks, which would have been a study in itself. Therefore, there are no measures of reliability and validity, which greatly reduces the usefulness of the ratings as a scale. Nonetheless, the results it yielded are consistent with self-determination theory, and its ratings created dissociation with actual memory performance in line with previous research. Thus, despite the roughness of the instrument, it appears to assess motivation consistent with earlier studies.

The eclectic approach to induce motivation created problems in identifying the responsible factors in the manipulation that actually made the difference in memory performance. For some, this is a critical problem because the conclusions are not very strong if one is theoretically unsure what actually was manipulated. This problem stems from the notion that motivation is a wide concept, and each different researcher appears to have his or her own private definition (Schunk, 2000). In the present thesis, motivation was induced as individual reward competition, stereotype threat, goal-setting, reward type (social vs. individual), chance of winning and using the discontinuity effect. Despite the fact that the instructions used in the present thesis were unorthodox, the motivation concept is such a broad concept that it can encompass them. At the present stage of the field, it is more essential to find a reliable motivator that affects memory performance than separating a multitude of similar motivational theories.

Perhaps the most important issue is the question of gender. In Study I, II, and III, only male participants were used, and this is not in line with

contemporary political and methodological recommendations in psychological research. However, this is a matter of a narrow starting point and parsimony. To test a series of new motivators' effects on memory performance, a preferable population of study is characterized by large size, some level of homogeneity, and accessibility. Furthermore, ignorance about memory psychology in general is an advantage, as knowledge about memory strategies could be an interfering factor because the baseline level of performance would leave too small room for improvement in performance from motivational instructions. This combined with the notion that gender was not of particular interest in Study I, II, and III, gender differences were only studied in Study IV.

Given the studies presented in the thesis and previous research, some conclusions can be inferred about motivation and episodic memory performance. First, there is a great need of systematic experimental research concerning motivation and memory performance. In essence, there is no real academic field of motivation and memory performance in psychology today. Numerous of the studies cited in the present thesis are mainly investigating other topics, and the studies rarely refer to other studies examining motivation and memory performance.

Second, it is not trivial to create a motivator which affects episodic memory performance. At the onset of the thesis work, perhaps naively, I thought that the thesis could mainly investigate the mechanisms through which motivation affects memory performance, but the empirical work has been more focused in finding a suitable motivator. Thus, the thesis is much more concentrated on motivational issues than initially intended. However, the initial onset of the thesis reflect the pattern found in Nilsson's (1987) study and Study I of a dissociation between subjective beliefs and actual memory performance. That is, some people tend to believe that motivation, per se, improves memory performance. Possibly, the reason why people think this is because motivation often means more favorable learning behavior, such as repetition and rehearsal. The truth, however, is not that simple. In many cases, motivation does not affect episodic memory performance all, whereas some elaborated motivators used in Study III and IV do when the test phase is generous.

Third, chance of winning appears to be more like a necessary component than sufficient in reward competition motivators to successfully affect episodic memory performance. Given the results of Study III and IV, the chance of winning is aided by group processes in a competition instruction.

Fourth, motivational effects on memory performance are probably most evident when the motivator is aimed at the retrieval process

(Graham & Golan, 1991; Reysen, 2003), or when the memory task allows a long test time (Study III and IV). Furthermore, there is, as far as I know, no published study that has reported motivational effects on recognition performance. In contrast, all the experiments that have showed an effect from motivation have used a recall task, though there are studies that report no effects on recall performance. However, this does not mean that all motivators invariably affect recall performance, as the motivators may be ineffective to increase the level of motivation. Thus, there is a strong case that the persistent retriever notion is valid. Nonetheless, in line with the encoding specificity principle, which implies that there is an overlap between memory encoding and retrieval, it is not possible to completely rule out importance of the encoding phase given the data sets in this thesis.

Fifth, there might be a historic explanation why studies III and IV did affect episodic memory performance, whereas other inductions of motivation did not. Some past inductions of motivation have, perhaps for theoretical reasons, been exclusively rooted in hedonism such as reward (Nilsson, 1987; Study I). In contrast, other studies have their roots in voluntarism that focused on the soul or self by involving the ego (Graham & Golan, 1991; Study II), personal goals (West, Welch, & Thorn, 2001), and the belief of proficiency (Klein, Loftus, & Fricker, 1994). However, studies III and IV have components from both frameworks, as the reward stems from hedonism, and group process is rooted in voluntarism. Possibly, both frameworks are interacting in the induction, where reward facilitates initiation, and group processes with high chance of winning ameliorate persistence. That is, in a relatively uninteresting task such as memorizing nouns, individuals may require a reward to even start learning, and group processes with high chance of winning could make the participants keep trying to generate possible items for a longer period of time. Furthermore, this historic perspective suggests an important theoretical insight as many motivational theories might be excessively focused on only one aspect of hedonism and voluntarism, and that future theories might be more efficient if they account for both of them.

Finally, the present thesis has investigated an important field for educational purposes. However, the thesis' onset has been very basic, and the direct applications are limited. Nonetheless, one important conclusion for educators is that the impact of motivation is generally overrated in terms of laboratory episodic memory performance. If learners are exposed to the stimulus material repeatedly, then their motivation to learn it is of little consequence compared to other factors such as attention, assuming that less motivated learners have some level of motivation. Furthermore,

the notion that motivation is probably most critical in the retrieval phase suggests that educators' efforts to increase student motivation in the encoding phase are less important, assuming that the students are concentrated enough to pay attention. In addition, the test procedure is critical too, since motivation, so far, has only affected recall and not recognition. This implies that motivation is probably not a concern in multiple choice tests, but might be a factor in examinations that demand free recall.

REFERENCES

- Ames, R., & Ames, C. (1984). Introduction. In R. Ames & C. Ames (Eds.), *Research on motivation in education* (pp. 1-11). London: Academic Press.
- Asch, S. (1956). Studies of independence and conformity: A minority of one against a unanimous majority. *Psychological Monographs*, 70 (Whole no. 416)
- Baddeley, A. (1991). *Human memory: Theory and Practice*. Allyn and Bacon.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. Freeman and Company.
- Bandura, A., & Locke, E. (2003). Negative self-efficacy and goal effects revisited. *Journal of Applied Psychology*, 88, 87-99.
- Bond, R., & Smith, P. (1996). Culture and conformity: A meta-analysis of studies using Asch's (1952b, 1956) line judgment task. *Psychological Bulletin*, 119, 111-137.
- Colley, A., Ball, J., Kirby, N., Harvey, R., & Vingelen, I. (2002). Gender-linked differences in everyday memory performance: Effort makes the difference. *Sex Roles*, 47, 577-582.
- Confer, C. (1981). The history of the concept of motivation. *Journal of the History of the Behavioral Sciences*, 17, 48-53.
- Covington, M. (1992). *Making the grade: A self worth perspective on motivation and school reform*. Cambridge University Press.
- Deci, E. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology*, 18, 105-115.
- Deci, E. L., Betley, G., Kahle, J., Abrams, L., & Porac, J. (1981). When trying to win: Competition and intrinsic motivation. *Personality and Social Psychology Bulletin*, 7, 79-83.
- Deci, E., Koestner, R., & Ryan, R. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, 125, 627-668.
- Deci, E., Ryan, R. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.
- Erngrund, K., Mäntylä, T., & Nilsson, L-G. (1996). Adult age differences in source recall: A population-based study. *Journal of Gerontology*, 51, 335-345.
- Freeman, J., & Ellis, J. (2003). The representation of delayed intentions: A prospective subject-performed task? *Journal of Experimental Psychology: Learning, Memory and Cognition*, 29, 976-992.

- Frieske, D., & Park, D. (1999). Memory for news in young and old adults. *Psychology and Aging, 1*, 90-98.
- Geen, R. (1995). *Human motivation: A social psychological approach*. Brooks/Cole Publishing Company.
- Goschke, T., & Kuhl, J. (1993). Representation of intentions: Persisting activation in memory. *Journal of Experimental Psychology: Learning, Memory and Cognition, 19*, 1211-1226.
- Graham, S., & Golan, S. (1991). Motivational influences on cognition: Task involvement, ego involvement, and depth of information processing. *Journal of Educational Psychology, 83*, 187-194.
- Grant, H., & Dweck, C. (2003). Clarifying achievement goals and the impact. *Journal of Personality and Social Psychology, 85*, 541-553.
- Greene, B., & Miller, R. (1996). Influences of achievement: Goals, perceived ability, and cognitive engagement. *Contemporary Educational Psychology, 21*, 181-192.
- Grolnick, S. & Ryan, R. (1987). Autonomy in children's learning: An experimental and individual difference investigation. *Journal of Personality and Social Psychology, 52*, 890-898.
- Henderlong, J., & Lepper, M. (2002). The effects of praise on children's intrinsic motivation: A review and synthesis. *Psychological Bulletin, 128*, 774-795.
- Herlitz, A., Nilsson, L-G., & Bäckman, L. (1997). Gender differences in episodic memory. *Memory and Cognition, 25*, 801-811.
- Hull, C. (1943). *Principles of Behavior*. New York: Appleton-Century-Crofts.
- Iyengar, S., & Lepper, M. (1999). Rethinking the value of choice: A cultural perspective on intrinsic motivation. *Journal of Personality and Social Psychology, 76*, 349-366.
- Hyde, T., & Jenkins, J. (1973). Recall for words as a function of semantic, gaphic and syntactic orienting tasks. *Journal of Verbal Learning and Verbal Behavior, 12*, 471-480.
- Iyengar, S., & Lepper, M. (2000). When choice is demotivating: Can one desire too much of a good thing? *Journal of Personality and Social Psychology, 79*, 995-1006.
- Johnson, M., Hastroudi., & Lindsay, D. (1993). Source monitoring. *Psychological Bulletin, 114*, 3-28.
- Klein, S., Loftus, J., & Fricker, S. (1994). The effects of self-beliefs on repeated efforts to remember. *Social Cognition, 12*, 249-261.
- Lewin, K. (1963). *Field theory in social science: Selected theoretical papers*. Tavistock Publications Ltd.

- Linnenbrink, E., Ryan, A., & Pintrich, P. (1999). The role of goals and affect in working memory functioning. *Learning and Individual Differences, 11*, 213-230.
- Locke, E., & Latham, G. (2002). Building a practically useful theory of goal setting and task motivation. *American Psychologist, 57*, 705-717.
- Marsh, R., Hicks, J., & Bink, M. (1998). Activation of completed, uncompleted, and partially completed intentions. *Journal of Experimental Psychology: Learning, Memory and Cognition, 24*, 350-361.
- McDonald, H., & Hirt, E. (1997). When expectancies meet desire: Motivational effects in reconstructive memory. *Journal of Personality and Social Psychology, 72*, 5-23.
- Murphy, K., & Alexander, P. (2000). A motivated exploration of motivation terminology. *Contemporary Educational Psychology, 25*, 3-53.
- Muter, P. (1978). Recognition failure of recallable words in semantic memory. *Memory and Cognition, 6*, 9-12.
- Nicholls, J. (1984). Conceptions of ability and achievement motivation. In R. Ames & C. Ames (Eds.), *Research on motivation in education* (pp. 39-73). London: Academic Press.
- Nilsson, L-G. (1987). Motivated memory: Dissociation between performance data and subjective reports. *Psychological Research, 48*, 183-188.
- Pajares, F., & Miller, D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem solving: A path analysis. *Journal of Educational Psychology, 86*, 193-203.
- Pajares, F., & Graham, L. (1999). Self-efficacy, motivation constructs and mathematics performance of entering middle school students. *Contemporary Educational Psychology, 24*, 124-139.
- Payne, D., Hembrooke., & Anastasi, J. (1993). Hypermnnesia in free recall and cued recall. *Memory and Cognition, 21*, 48-62.
- Pemberton, M., Insko, C., & Schopler, J. (1996). Memory for and experience of differential competitive behavior of individuals and group. *Journal of Personality and Social Psychology, 71*, 953-966.
- Pietsch, J., Walker, R., & Chapman, E. (2003). The relationship among self-concept, self-efficacy, and performance in mathematics during secondary school. *Journal of Educational Psychology, 95*, 589-603.
- Scholz, U., Doña, B., Sud, S., & Schwarzer. (2002). Is general self-efficacy a universal construct? *European Journal of Psychological Assessment, 18*, 242-251.

- Schopler, J., Insko, C., Wieselquist, J., Pemberton, M., Witcher, B., Kozar, R., Roddenberry, C., & Wildschut, T. (2001). When groups are more competitive than individuals: The domain of the discontinuity effect. *Journal of Personality and Social Psychology, 80*, 632-644.
- Schunk, D., Hanson, A., & Cox, P. (1987). Peer-model attributes and children's achievement behaviors. *Journal of Educational Psychology, 79*, 54-61.
- Schunk, D. (2000). Coming to terms with motivational constructs. *Contemporary Educational Psychology, 25*, 116-119.
- Skinner, B. (1953). *Science and human behavior*. New York: MacMillan.
- Smith, R. (1989). Effects of coping skills training a generalized self-efficacy and locus of control. *Journal of Personality and Social Psychology, 56*, 228-233.
- Steele-Johnson, D., Beaugard, R., Hoover, P., & Schmidt, A. (2000). Goal orientation and task demand effects on motivation, affect, and performance. *Journal of Applied Psychology, 85*, 724-738.
- Tulving, E. (1983). *Elements of episodic memory*. Oxford: Oxford University Press.
- Reysen, M. (2003). The effects of social pressure on group recall. *Memory and Cognition, 31*, 1163-1168.
- Ryan, R., & Deci, E. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25*, 54-67.
- Vancouver, J., Thompson, C., Tischner, C., & Putka, D. (2002). Two studies examining the negative effect of self-efficacy on performance. *Journal of Applied Psychology, 87*, 506-516.
- Weldon, S., & Bellinger, K. (1997). Collective memory: Collaborative and individual processes in remembering. *Journal of Experimental Psychology: Learning, Memory and Cognition, 23*, 1160-1175.
- Weldon, S., Blair, C., & Huebsch, P. (2000). Group remembering; Does social loafing underlie collaborative inhibition? *Journal of Experimental Psychology: Learning, Memory, and Cognition, 26*, 1568-1577.
- West, R., Welch, D., & Thorn, R. (2001). Effect of goal-setting and feedback on memory performance and beliefs among older and younger adults. *Psychology and Aging, 16*, 240-250.
- West, R., Thorn, R., & Bagwell, D. (2003). Memory performance and beliefs as a function of goal-setting and aging. *Psychology and Aging, 18*, 111-125.

- White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological Review*, 66, 297-333.
- Yerkes, R., & Dodson, J. (1908). The relation of strength of stimulus to rapidity of habit. *Journal of Comparative Neurology and Psychology*, 18, 459-482
- Yonelinas, A. (2002). The nature of recollection and familiarity: A review of 30 years of research. *Journal of Memory and Language*, 46, 441-517.
- Wildschut, T., Insko, C., & Gaertner, L. (2002). Intragroup social influence and intergroup competition. *Journal of Personality and Social Psychology*, 82, 975-992.
- Zimmerman, B. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology*, 25, 82-91.