



Do you dare to think outside the box?

Impacts of alcohol, negative affect and evaluation
apprehension on inhibition of creative performance

Nina Svensson

Faculty of Arts and Social Sciences

Psychology

DOCTORAL THESIS | Karlstad University Studies | 2016:20

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To some extent, sanity is a form of conformity. -John Nash

Doctoral Dissertation: Do you dare to think outside the box? Impacts of alcohol, negative affect and evaluation apprehension on inhibition of creative performance

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Abstract

Conditions relating to evaluation apprehension, alcohol and affect were investigated in relation to creative performance. Study I compared group work with individual work, and control conditions were compared with de Bono creativity-enhancing techniques. Study II studied the effect of alcohol and emotional-enhancing film material on primary-secondary process relations and creative performance. Study III explored experiences of working on a creative task after receiving negative feedback. Study IV investigated the relationship between fear of evaluation and creative performance. Study I showed higher scores on different measures of creative performance for group work, while individual work showed higher total fluency scores. Further, de Bono technique conditions showed lower fluency and lower flexibility. Study II showed signs of decreased creative performance after the intake of alcohol, and signs of increased primary process thinking but no effect of on creative performance after emotional enhancement. Study III showed that stress, fear of producing ‘incorrect’ responses and low self-efficacy were inhibiting factors on creative performance. Study IV showed that fear of evaluation was related to a lower self-efficacy, higher degree of worry, and higher degree of self-censorship. Further, Study IV showed that fear of negative evaluation had a positive relation to number of ideas produced, but no relation to quality of ideas. Additionally, support for creativity showed positive relations to both number of ideas produced and quality of ideas.

Keywords: Creativity, inhibition, group work, alcohol, emotion, creative self-efficacy, evaluation apprehension

Doktorsavhandling: Vågar du tänka utanför ramarna? Effekt av social påverkan, alkohol och negativ affekt på inhibering av kreativ prestation

Nina Svensson, Avdelningen för psykologi, Karlstad universitet

Sammanfattning

Syftet med avhandlingen var att undersöka hur rädsla för bedömning, alkohol och affekt påverkar inhibering av kreativ prestation. Studie I jämförde grupparbete med individuellt arbete samt två av de Bonos kreativitetstekniker med kontrollbetingelser. Studie II undersökte effekten av alkohol och känslomässigt filmmaterial på den kreativa prestationen. Studie III undersökte tankar och känslor under arbetet med ett kreativitetstest efter negativ feedback på ett problemlösningstest. Studie IV undersökte samband mellan rädsla för att bli bedömd och kreativ prestation. Studie I visade att grupparbete resulterade i högre medelpoäng för kreativ prestation, medan individernas kombinerade poäng för kreativ prestation var högre än gruppernas kombinerade poäng för kreativ prestation. Därtill visade Studie I att användning av de Bonos tekniker gav lägre fluens och lägre flexibilitet. Studie II visade att alkoholgruppens kreativa prestation var lägre än placebo-gruppens och kontrollgruppens prestationer. Däremot visades ingen effekt av känslomässigt filmmaterial på kreativ prestation. Studie III visade att stress, rädsla för att producera "felaktiga" svar och låg tilltro till svaret var hämmande faktorer på den kreativa prestationen. Studie IV visade att högre grad av rädsla för att bli bedömd av andra var relaterad till lägre tilltro till förmågan att producera idéer, högre grad av oro, och högre grad av självzensur. Vidare visade Studie IV att rädsla för att bli bedömd av andra hade en positiv relation till antal idéer som producerades, men ingen relation till kvaliteten på idéerna. Grad av stödjande klimat för kreativitet hade positiv relation till både antal idéer som produceras och kvaliteten på idéerna.

Nyckelord: Kreativitet, inhibering, grupp, alkohol, emotioner, kreativt självförtroende, rädsla för bedömning

List of studies

This thesis is based on the following four research papers, which will be referred to in roman numbers:

- I: Svensson, N., Norlander, T. & Archer, T. (2002). Effects of individual performance versus group performance with and without de Bono techniques for enhancing creativity. *The International Journal of Thinking and Problem Solving*, 12 (2), 15–34.
- II Svensson, N., Archer, T., & Norlander, T. (2006). A Swedish version of the regressive imagery dictionary: effects of alcohol and emotional-enhancement on primary-secondary process relations. *Creativity Research Journal*, 18 (4), 459–470. DOI: 10.1207/s15326934crj1804_5
- III Svensson, N. (2015). Subjective experiences of creative work after negative feedback. *Thinking Skills and Creativity*, 15, 26–36. DOI: 10.1016/j.tsc.2014.11.002
- IV Svensson, N. & Kristensson, P. The effect of evaluation apprehension on creative performance at everyday workplaces. *Manuscript in preparation*.

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Table of contents

1. INTRODUCTION	1
1.1 CREATIVITY.....	1
1.1.1 <i>The creative product</i>	2
1.1.2 <i>The creative person</i>	4
1.1.3 <i>The creative process</i>	6
1.1.4 <i>The creative place</i>	8
1.1.5 <i>Critique of the four P's</i>	11
1.2 PERSPECTIVES ON CREATIVITY	12
1.2.1 <i>The psychodynamic perspective</i>	12
1.2.2 <i>The cognitive perspective</i>	14
1.2.3 <i>The biological perspective</i>	16
1.2.4 <i>The social perspective</i>	19
1.3 CREATIVE PERFORMANCE AND INHIBITION	21
1.3.1 <i>Evaluation apprehension and social influence on creative performance¹</i>	22
1.3.2 <i>de Bono and creative performance</i>	23
1.3.3 <i>Alcohol and creative performance</i>	25
1.3.4 <i>Negative affect and creative performance</i>	28
1.4 RATIONALE OF THE INVESTIGATION	29
2. THE PRESENT INVESTIGATION	32
2.1 INTRODUCTION	32
2.2 STUDY I: EFFECTS OF INDIVIDUAL PERFORMANCE VERSUS GROUP PERFORMANCE WITH AND WITHOUT DE BONO TECHNIQUES FOR ENHANCING CREATIVITY.....	33
<i>General aim</i>	33
2.2.1 <i>Experiment 1</i>	33
2.2.2 <i>Experiment 2</i>	36
2.2.3 <i>Experiment 3</i>	39
2.3 STUDY II: A SWEDISH VERSION OF THE REGRESSIVE IMAGERY DICTIONARY: EFFECTS OF ALCOHOL AND EMOTIONAL ENHANCEMENT ON PRIMARY-SECONDARY PROCESS RELATIONS	44
<i>General aim</i>	44
2.3.1 <i>Experiment 1</i>	44
2.3.2 <i>Experiment 2</i>	48
2.4 STUDY III: SUBJECTIVE EXPERIENCES OF CREATIVE WORK AFTER NEGATIVE FEEDBACK.....	50
<i>General aim</i>	50

2.5 STUDY IV: THE EFFECT OF EVALUATION APPREHENSION ON CREATIVE PERFORMANCE AT EVERYDAY WORKPLACES	53
<i>General aim</i>	53
2.5.1 <i>Survey 1</i>	54
2.5.2 <i>Survey 2</i>	57
3. DISCUSSION.....	61
3.1 MAIN FINDINGS.....	61
3.2 IMPLICATIONS OF FINDINGS.....	63
3.3 LIMITATIONS AND FUTURE RESEARCH.....	70
3.4 SUMMARY AND FINAL CONCLUSIONS	74
4. ACKNOWLEDGEMENTS.....	77
5. REFERENCES	78

Study I

Study II

Study III

Study IV

1. Introduction

Creativity is a fascinating issue for many people; among other reasons, this might be because a creative idea is different from how we usually think. Creative ideas have led to great achievements in the arts and scientific breakthroughs throughout history, and creative thinking is of great importance in society today, as many companies rely on product development and innovation (Florida, 2006). There are indications that societies with high economic growth also have a high level of creativity (Florida, 2006). However, it is important to note that creative thinking does not only concern great achievements on a societal level: everyday creativity can also be fruitful and joyful, and involves the same processes as groundbreaking innovation. Thus, it is important to perform research on creativity not only because creativity is connected to great breakthroughs and economic growth (Florida, 2006), but also because creative expressions have been connected to subjective wellbeing (e.g., Burt & Atkinson, 2012). Therefore, much can be gained from a greater understanding of creativity and how creativity can be supported.

Many people find it difficult to be creative, and there is a popular belief that it takes a special personality to be creative. In this thesis, the focus is less on personality and more on different conditions in our environment that can facilitate or inhibit (hinder) the creative process. The underlying assumption of the thesis is that all people may be more or less creative in their area of interest, but not everyone is going to be creative, depending on the context in which they are situated.

1.1 Creativity

Creativity is a very broad concept, and the term can refer to several different features. In the broader field of creativity, four different aspects of creativity have been identified (“the four P’s”; e.g., Agars & Kaufman, 2005; Rhodes, 1961): the creative *process*, the creative *product*, the creative *person*, and the creative *press* (also called *place*). More recently, Glăveanu (2013) argued that the four P’s were not sufficient to describe the phenomenon of creativity, as the social perspective was not sufficiently reflected in the four P’s framework. Alternatively, Glăveanu

(2013) introduced the five A's as a means to describe creativity. The five A's consists of *actor* (corresponding to person), *action* (corresponding to process), *artifact* (corresponding to product), *audience* (corresponding to place), and *affordances* (corresponding to place). In addition, there are other models of creativity, such as path-of-least-resistance (Ward, 1995), the geneplore model (Finke, Ward, & Smith, 1996) and confluence models such as the investment theory of creativity (Sternberg & Lubart, 1996). However, the four P's framework has perhaps had the greatest impact on the field. Below, theories and research within the domains of the four P's are reviewed.

1.1.1 The creative product

The creative product or artifact is the result of the creative process; that is, the idea or artifact produced by an individual. A widespread definition of the creative product is that it is both new to the individual and that it has value or usefulness (e.g., H. J. Eysenck, 1997; Martindale, 1999; Runco & Jaeger, 2012). This definition has been used for over 60 years, and Stein (1953) argued early on that it is not enough for creative work to be novel; rather, it should also be useful or accepted by some sort of group at some point in time. Stein argued that this was "the final test of reality" (1953, p. 318). Thus, creative work is viewed to have practical applications, although the purpose of the work can be very varied. For example, scientific work, with the purpose to produce new knowledge, and artistic work, with the purpose to arise emotions and reactions, are both considered as being *creative* (Sawyer, 2006). This definition has been used to separate 'genuine' creative work (that is, work with a purpose) from 'pseudo-creativity' represented by random, thoughtless production (Cattell & Butcher, 1968; A. Cropley, 2006; de Souza et al., 2010) and 'quasi-creativity' in the form of thoughts with a high level of novelty but without relation to reality, such as daydreaming (Heinelt, 1974, as cited by D. Cropley & Cropley, 2008). According to Cattell and Butcher (1968), the tendency to rate anything odd as original has led to the overestimation of creative achievement among persons suffering from psychiatric illnesses such as psychosis.

Further, there are concerns that there has been an over-emphasis on the novelty aspect of the creative product (e.g., Makel & Plucker,

2014; Sawyer, 2006). Makel and Plucker (2014) argued that replication in science is part of the creative process, as replication can reveal weaknesses in research design and procedure. Sawyer (2006), on the other hand, maintained that the focus on novelty in Western cultures leads to the underrating of creations from other cultures in which novelty is not as highly desired.

Research on creativity is often performed by measuring the creative product by divergent thinking tests (Copley, 1997; Runco & Acar, 2012; Zeng, Proctor & Salvendy, 2011); the creative product is often measured by scoring fluency (number of responses), flexibility (qualitative variety of responses) and originality (novelty and uniqueness of responses) (Runco & Acar, 2012; Zeng, Proctor & Salvendy, 2011). This classification was grounded by Guilford (1950), who presented several key components for creativity. Fluency is usually measured by counting number of responses, and flexibility is usually measured by counting number of categories presented. Guilford (1950) proposed that originality should be measured by the relative frequency of a response in the total number of responses, but nowadays originality is usually measured by the consensual assessment technique proposed by Amabile (1982).

However, there are concerns that creativity exhibited in the laboratory does not correspond to real-life creativity. For example, the concept of fluency has no foundation in the definition of creativity, as the definition only states that an idea or product has to be novel and appropriate to count as creative (Zeng, Proctor & Salvendy, 2011), and therefore originality and flexibility are more closely associated to creative potential than fluency (Runco & Acar, 2012). Zeng, Proctor and Salvendy (2011) also argued that it is difficult to judge appropriateness on divergent thinking tests, as the tests seldom place the response in a real-world context, and as a consequence, measurements of appropriateness can be unreliable. Further, performance on divergent thinking tests has shown a relation to real-life creative achievements, but the relation seems weak (e.g., K. H. Kim, 2008). Therefore, it is important to note that divergent thinking tests do not measure all aspects of creativity, and that they should be viewed as tests of creative potential instead (Runco & Acar, 2012).

For the reasons discussed above, it is also common to measure creative achievements in real life; for example, with the Creative Achievement Questionnaire (Carson, Peterson & Higgins, 2005), which

measures achievements in ten different domains including visual arts, creative writing and scientific discovery. Further, creative tasks where participants have to write a poem or create a collage, for example, can be used, where the product is rated on creativity measures by a panel of judges (e.g., Ruscio, Whitney & Amabile, 1998). Another way to test real-life creative achievements is by letting a supervisor grade creative performance at work (e.g., Madjar, Oldham & Pratt, 2002).

1.1.2 The creative person

Much research has been done on the personality of the creative person. A person's personality can be defined as a set of characteristics that affects how that person thinks, acts and feels in different situations (Pervin, Cervone & John, 2005). Further, these characteristics are considered stable over time (Pervin, Cervone, & John, 2005). Pervin, Cervone and John (2005) asserted that one's personality develops mainly during childhood, although this development is considered to be affected by and interact with the inborn temperament. The focus on the creative person represents the view that differences in creative potential between individuals are in part grounded in differences in personal characteristics. H. J. Eysenck (1997) stated that "a trait of creativity can be postulated as a dispositional construct making possible [creative] behaviour and differentiating people who show much, a modicum, or little creativity" (p. 42). Thus, the creative person has the ability to exhibit creative behavior under the right circumstances. Several tests for creative ability have been developed based on the assumption of a creative personality, such as the Creative Personality Scale (Gough, 1979).

Early research indicated that creative persons often show high levels of introversion, independence, autonomy, ego-strength, intuitiveness and impulsiveness (e.g., Dellas & Gaier, 1970). Moreover, early research has shown a relation between creativity and intelligence, up to IQ scores of approximately 120 (e.g., R. M. Smith & Neisworth, 1966) – an IQ level above 120 did not seem to further enhance creative ability. This was called a threshold effect of the IQ. However, even though the threshold theory has been well established, there has been little evidence for such a threshold. (e.g., K. H. Kim, 2005; Runco & Albert, 1986; Sligh, Conners, & Roskos-Ewoldsen, 2005). K. H. Kim (2005)

performed a meta-analysis using 21 studies and 45,880 participants, which showed only a weak relationship between IQ and creativity ($r=.174$), and no threshold effect for IQ. Sligh, Conners and Roskos-Ewoldsen (2005) argued that previous studies on the topic had been flawed in two ways: firstly, the span of variance for high IQ groups had generally been (too) small, which could lead to the underestimation of a potential correlation; secondly, many studies have not differentiated between crystallized intelligence (which is knowledge-based) and fluid intelligence (which concerns flexible thinking and reasoning). In a study designed to avoid these flaws, Sligh, Conners and Roskos-Ewoldsen (2005) found no evidence of a threshold effect. However, for the average IQ group, crystallized IQ correlated with creativity, whereas fluid IQ did not. For the high IQ group, the relationship was the opposite: fluid IQ correlated with creativity, whereas crystallized IQ did not.

More recent research has used personality tests to assess the creative personality. One widespread personality test is the Five Factor model (McCrae & Costa, 1987), which has been used in many studies investigating the relationship between personality and creativity. The Five Factor model consists of five major factors of personality: neuroticism, agreeableness, conscientiousness, extraversion and openness to experience. Several studies have shown relations between various factors and creativity (e.g., Feist, 1998). According to Feist (1998), personality profiles seem to be different depending on which domain one belongs to (for example, artistic creativity or scientific creativity, where artistic creativity seems to have a stronger connection to emotional instability and rejection of norms than scientific creativity). The personality factor that consistently relates to creative performance is *openness to experience* (McCrae, 1987; Feist, 1998). However, this might not be so surprising, seeing that the factor openness to experience includes items concerning imagination and aesthetics (McCrae & Costa, 1987). Thus, the openness to experience scale could be very similar to the concept of self-rated creative potential.

Further, research has been conducted on a possible connection between mental illness (mainly psychosis and bipolar disorder) and creativity. Results have been conflicting (see Waddell, 1998); while some studies found a higher prevalence of mental illness for persons within creative professions (e.g., Kaufman, 2001; Kyaga, Lichtenstein, Boman, Hultman, Långström & Landén, 2011), other studies did not

find any connection between creativity and mental illness (e.g., McCrae, 1987). Research that has shown a positive connection between mental illness and creativity has often used samples of eminent persons within creative fields (such as famous authors and poets), whereas research that showing no such connection – or a negative connection – has often used samples of patients suffering from mental illness. Waddell (1998) performed a critical literature review on 29 studies and 34 review articles on creativity and mental illness, concluding that many studies in the area have used flawed designs, and that it was common to misinterpret results so that the conclusion was that a connection existed, when in fact data did not support such a conclusion. Johnson et al. (2012) have also pointed to flaws in designs of older research regarding the connection between mental illness and creativity, such as investigating dead persons with no objective measure of mental illness. Carson, Peterson and Higgins (2003) found that decreased latent inhibition (a reduced capacity to filter irrelevant stimuli) was positively associated with creative achievement. Carson, Peterson and Higgins suggested that intelligence could be a moderating factor determining whether latent inhibition will lead to deficits in attention or to creative achievements.

The view that a creative personality exists is disputed. Sawyer (2006) argued that the idea of the creative person as an isolated rebel is a myth, and that persons adapt to that idea in order to be perceived as more creative. Further, Sawyer (2006) maintained that creative achievements are often a result of a favorable social environment and collaboration.

1.1.3 The creative process¹

The creative process refers to the work (conscious or unconscious) done by the individual in order to obtain a creative product. Influential models include Wallas's model of four stages of the creative process (Wallas, 1970/1926), the geneplore model (Finke, Ward, & Smith, 1996) and divergent and convergent thinking (Guilford, 1957).

Wallas (1970/1926) proposed that the creative process can be divided into four different stages: preparation (a problem is presented and information is gathered), incubation (the problem is processed), illumination (ideation) and verification (the idea is confirmed and elab-

orated). These stages have been shown empirically (e.g., Horng & Hu, 2009; Norlander, 1997; Patrick, 1935, 1938). During the preparation stage, ideas and associations are flowing (Patrick, 1935, 1938), and the stage is measured by counting the number of thought changes. Incubation is implicated by repetitions of moods or ideas. There is no limit for how short or how long the incubation stage will last. The illumination stage occurs when a distinct idea has been formulated. The idea is described and evaluated during the verification stage (Patrick, 1935, 1938). These stages are at present day used to describe the creative process, and the model has also been expanded. For example, A. Cropley and Cropley (2008) argued that there is a communication stage after the verification stage, where the individual shares the result of the creative process, and a validation stage, where other persons judge if the product is creative or not.

However, it is important to note that not everybody agrees to the linear description of the four stages model; for instance, Sawyer (2006) argued that the arrival of one, great idea is a creative myth, and that the process is more circular, with many smaller ideas that develop into the final solution. In addition, Lubart (2001), also criticized the linearity of the four stage model, and argued that the creative process may consist of different actions that take place simultaneously. In accordance with a circular view of creativity, Finke, Ward and Smith (1996) proposed a model of creativity that they called the *geneplore* model. According to the *geneplore* model, creative cognition consists of a generative phase, where preinventive structures are generated, and an explorative phase, where the preinventive structures are explored and interpreted. Both the generative phase and the explorative phase are influenced by constraints of the task (such as time limits). Finke, Ward and Smith (1996) emphasized that the process is cyclic, and that the exploration phase can give rise to new preinventive structures.

Guilford (1957) distinguished between *convergent thinking* and *divergent thinking*. Convergent thinking implies thinking in a specific direction, towards a specific solution that meets certain criteria. Divergent thinking implies thinking in different directions simultaneously, which involves a broader search in memory for a solution on a problem. Therefore, divergent thinking can lead to several different solutions, with no obvious 'right' solution. The ability to think of many possible solutions has been linked to creativity and originality, and divergent

thinking tests are often used as measurement of creative potential (A. Cropley, 1997; H. J. Eysenck, 1997).

According to Guilford (1968), creativity involves several aspects, namely *fluency* (the number of ideas produced), *novelty* or *originality* (how rare and unusual the ideas or responses are), *flexibility* (the variety of the class of responses, or the alteration of the interpretation of a task), *synthesizing* (organization of ideas into larger patterns), *analyzing* (breaking down patterns or structures into parts), *elaboration* (degree of completeness or detail of the idea or artifact) and *evaluation* (selection of realistic or appropriate ideas). Evaluation is an important aspect of creativity, as a creative idea or artifact has to have some use or value (e.g., Stein, 1953). However, Guilford (1968) pointed out that evaluation based on fear of being unconventional, socially unacceptable or being wrong might inhibit creativity. According to A. Cropley (1997), the aspects that are commonly measured by tests on creative performance (often in the form of divergent thinking tests) are fluency, flexibility and originality. However, there are concerns that these measurements do not fully capture the concept of creativity. Although studies have shown correlations between scores on divergent thinking tests and creative achievements (e.g., K. H. Kim, 2008), there are some concerns regarding equating divergent thinking with creativity. Firstly, the correlation between divergent thinking tests and creativity is often weak (see, for example, K. H. Kim, 2008). Further, creativity is considered to be domain-specific (e.g., Sawyer, 2006), and tests of divergent thinking are measuring a general ability. Some domains, such as arts, seem to have a stronger association with divergent thinking tests (K. H. Kim, 2008), while others, such as music, seems to have a weaker (K. H. Kim, 2008) or non-existent association (Klimas-Kuchtowa, 1998). Moreover, different measures on the divergent thinking tests have been shown to correlate to different degrees of creative achievement. Chu and Lin (2013) found a higher correlation between originality and creative achievement than between fluency and flexibility and creative achievement.

1.1.4 The creative place

The creative place regards environmental factors, which can enhance or obstruct creative performance. Research has focused on crea-

tivity in organizations, such as creativity and innovation in workplaces and creativity in education. Several factors have been connected to a creative climate that will facilitate creative performance. Moultrie and Young (2009) synthesized factors identified in previous research into seven themes that are related to a creative climate: time, risks, conflicts, rewards, challenge, debate and freedom. Each theme will be discussed below.

Time. It is important that an organization provides enough time for creative results to be obtained (Ekvall, 1997). As mentioned in section 1.1.3, it is difficult to know beforehand how long the incubation stage will last. Therefore, one can miss many creative ideas if the time limit is too strict. A strict time limit can also induce stress, hinder experimentation and hinder playfulness, which in turn will inhibit creativity (Ekvall, 1997).

Risks. As creativity concerns thinking in new directions and doing things differently than before, it is only natural that failures will occur. In a creative environment, there must be acceptance for mistakes; otherwise, no one will dare to take the risk of failure (Nemeth, 1997). Research has shown that departments dealing with new product development exhibit a higher level of risk-taking than departments dealing with adaptations of existing products (Ekvall, 1997). Regarding educational creativity, a very strong focus on producing correct answers for questions and tests can be viewed as a way to educate children to take less risks in creative situations (Nickerson, 2010), and thus the schooling system should place more focus on problem formulation and alternative solutions in order to foster creativity.

Conflicts. Conflicts between co-workers can draw energy and focus from the task at hand, and research has shown that environments with many conflicts are related to a lower degree of creative performance (Ekvall, 1997). According to Nemeth (1997), a risk of exclusion from a group will lead to a high level of conformity, as group members do not want to risk their position in the group.

Rewards. Research has shown that support and recognition from a supervisor is important for a creative climate (Ekvall, 1997). According to Sawyer (2006), it is important to receive recognition for a creative idea in order to continue to present ideas to others. This does not necessarily mean that one will obtain some sort of external reward; the crucial factor is the feedback and recognition provided by others. Stud-

ies have shown that work support is positively related to creative performance (e.g., T. Y. Kim, Hon & Lee, 2010; Madjar, Oldham & Pratt, 2002), and Shalley and Gilson (2004) concluded that support from supervisors will increase the likelihood that employees will exhibit creative behavior.

Challenge. Challenge and commitment are important for the creative performance. Hunter, Bedell and Mumford (2007) showed in a meta-analysis that challenge and intellectual stimulation exhibited high effect sizes in studies connecting creative climate with creative performance. Further, creativity has been linked to intrinsic motivation (see also section 1.2.4 the social perspective), where high levels of intrinsic motivation are connected to higher creative performance (Amabile, 1996).

Debate. One of the creative abilities is the ability to synthesize parts into something new (Guilford, 1968), and according to Sawyer (2006), high diversity among group members will facilitate this. Sawyer (2006) argued that group members with very different experiences will enhance the chances of new combinations, and the combination of knowledge bases is also considered to be one of the main reasons for working in groups on creative tasks (Stasson & Bradshaw, 1995). However, it is important that all persons have a say in the group, and that the communication is focused on the task. According to Ekvall (1997), debate and playfulness are associated with a creative climate. Further, Hunter, Bedell and Mumford (2007) found that positive collegial exchange was strongly associated to creative performance.

Freedom. Nemeth (1997) argued that too much control from a higher level of a hierarchy will suppress creativity and novel solutions for problems. Hunter, Bedell and Mumford (2007) found that autonomy and sufficient resources are important factors of the creative climate. They also argued that these factors are often emphasized in the literature on creative climate, as these factors can be changed relatively easily. Ekvall (1997) also showed that freedom was an important factor with regard to the creative climate. Further, Hunter, Bedell and Mumford (2007) argued that changes in the climate with regard to the factors *autonomy* and *resources* can signal to co-workers that creative performance is possible.

However, the creative place can also be interpreted as a more all-embracing concept on the societal level (Sawyer, 2006). Florida (2006)

pointed out that cities with high growth and high level of creativity are characterized by high levels of diversity and tolerance among their inhabitants.

1.1.5 Critique of the four P's

Megalakaki, Craft and Cremin (2012) stated that there has been a transition from univariate models of creativity to multivariate models of creativity. In multivariate models, also called confluence models, emphasis is put on the interplay between several factors, and creativity is viewed as a complex phenomenon. According to Megalakaki, Craft and Cremin (2012), early models of creativity (such as the four stages described by Wallas) were mainly univariate, and do not explain all processes involved in creative performance. In line with this, Glăveanu (2013) reviewed articles on the four P's, coming to the conclusion that the model – as it is used – is too focused on the individual, failing to sufficiently consider the social perspective of creativity. According to Glăveanu (2013), it is important to remember that creativity is a dynamic and integrated process. Therefore, Glăveanu (2013) extended the model, developing the five A's model. The five A's consists of *actor* (corresponding to person), *action* (corresponding to process), *artifact* (corresponding to product), *audience* (corresponding to place) and *affordances* (corresponding to place). The main purpose of this adaptation was to develop a more dynamic model, with greater consideration to context. For example, Glăveanu (2013) substituted the concept *person* with the concept *actor* in order to emphasize that the personality is not isolated from the world around it; an *actor* choses to perform a certain behavior in a social context and is therefore active, whereas a *person* can be passive. The five A's model implicates that research should recognize a dynamic view on creativity, and that the impact of the social context should be considered.

In addition, there are a number of confluence models of creativity. Confluence models emphasize that creative performance is the result of the interplay between different components, and that creative ability cannot be seen as a summation of the individual's ability for each component (Sternberg, 2006). One example of a confluence model of creativity is the investment theory (Sternberg & Lumbart, 1996), which

states that creativity depends on the interaction between intellectual abilities, knowledge, styles of thinking, personality, motivation, and environment.

1.2 Perspectives on creativity

Psychology is a discipline that aims at explaining humans' emotions, thoughts and behaviors, and therefore has to cover several levels of explanation. The main levels of explanation are the biological level, the personal level and the social level. The personal level can also be explained by different perspectives, such as the psychodynamic and the cognitive perspectives.

To obtain a thorough outlining of creativity, one has to consider different views and explanations. Therefore, the psychodynamic view, the cognitive view, the biological view and the social view on creativity are discussed below.

1.2.1 *The psychodynamic perspective*¹

The psychodynamic perspective focuses on the importance of unconscious drives and wishes for creative performance, and has mainly been connected with artistic creativity. The focus has been on the creative person, and somewhat on the creative process.

In the psychodynamic perspective, thinking is divided into *primary process thinking* and *secondary process thinking* (Freud, 2003/1911), where primary process thinking refers to either an immature thinking style used by children or the discharging and shifting energy of the id or the immature ego, and secondary process refers to a mature thinking style, or the binding of energy (Brenner, 1990). Freud (2003/1911) considered primary process to be associated with unconscious processes, whereas he considered secondary process to be associated with conscious processes. Suler (1980) asserted that primary process thinking is associative, symbolic, illogical and impulsive, and Russ (2001) maintained that primary process is prevalent in dreaming. Primary process relates to subjective experiences, and concerns the individual's affects and motivations (Noy, 1969). Further, primary process

is considered to be representational, which for example can be demonstrated by the experience of 'seeing' a vivid image when imagining something (Noy, 1969). Primary process has been related to parallel processing of information (Neisser, 1967).

Secondary process thinking is considered to operate in a logical, conceptual and realistic manner (Suler, 1980) and to be reality-oriented (Noy, 1969). Secondary process enables 'self-monitoring' which allow individuals to interact with the environment appropriately (Noy, 1969). Secondary process may have a relation to language development (Noy, 1969), as language makes it possible to use abstract thinking and to put words on the representational experiences. Secondary process has been related to sequential processing of information and executive control (Neisser, 1967).

Primary process has been considered a primitive form of thinking that is used by children, whereas secondary process has been considered a form of thinking that is more sophisticated and develops as the individual matures (Brenner, 1990). This notion implies that thinking operates on a primary-secondary process continuum, and that adult individuals normally use a thinking style closer to the secondary process end-point. Kris (1971/1952) proposed that one would have to use regression in the service of the Ego in order to use primary process. However, Suler (1980) disagreed with this view, and instead proposed that primary process and secondary process are separate processes that interact with one another, whereby usage of primary process is a matter of access, not regression.

In the psychodynamic perspective, creativity originates from the interplay between primary and secondary processes, and even usage of the two processes simultaneously, while a thinking style characterized by relatively high usage of secondary process is considered to be related to poor creative performance (Martindale, 1999). According to Arieti (1978), highly creative performance is related to the integration of primary process thinking with secondary process thinking, whereas a poor creative performance can be related to suppression of primary process thinking, and psychopathological disorders, where primary process thinking is used in an excessive manner. Primary and secondary process have been related to Wallas's four stages model of creativity, where primary process is considered to be related to the inspirational stages incubation and illumination, and secondary process is considered to be

related to the elaborative stage verification (Katz, 1997). Noy (1969) maintained that artistic creativity begins with usage of primary process thinking, but that secondary process thinking gradually is used more. Thus, the creative process becomes more reality-oriented, which facilitates adaptations to environment and context. Accordingly, in the psychodynamic perspective, creative work is considered to be inhibited by relatively overusing secondary process; the more reality-oriented secondary process suppresses the more unrealistic primary process so that the individual can adapt to society or to suppress the individual's unwanted feelings and wishes. However, Noy (1969) argued that primary process also has to be developed to be used properly, and thus, one can improve his or her ability to use primary process, and consequentially his or her creative ability. Thus, in the psychodynamic view, ideation is inhibited by a relatively high occurrence of secondary process.

1.2.2 The cognitive perspective

The cognitive perspective focuses on the creative process that underlies the creative product. Attention and knowledge processing are considered to be important aspects of the creative process.

In the cognitive perspective, creative performance has been connected to divergent thinking (e.g., A. Cropley, 1997), which in turn has been connected to parallel processing (A. Miller, 1987), which allows the individual to perform multiple activities simultaneously. In the cognitive perspective, creative performance originates from new combinations of old memories (Mednick, 1962). This could explain why it is considered to be difficult to come up with new ideas and be innovative; memories with high association strengths are more easily retrieved, and once retrieved, will prevent the retrieval of other memories (M. C. Anderson & Spellman, 1995). In line with this, Mednick (1962) proposed that the creative performance will be affected by the association strength between memories. If a stimulus show high association strength to one or two conventional elements, the associative hierarchy will be steep, leading to few associations. On the other hand, if a stimulus shows weak association strength to several elements, there is a higher probability for a flat associative hierarchy, leading to a higher number of associations that are more original. According to Martindale

(1999), defocused attention will facilitate parallel processing, and parallel processing will increase the likelihood of flat associative hierarchies. Martindale (1999) even suggested that the concepts of defocused attention and flat associative hierarchies essentially describe the same phenomenon.

One theory of creativity that is based on usage of memories is the path-of-least-resistance (Ward, 1995). According to the theory, our previous knowledge will affect which memories that are easily accessible. More precisely; retrieval of specific occurrences (exemplars, representations of a class) will inhibit more original memories from being retrieved. For example, Ward (1995) maintained that it is hard to come up with an entirely new creature (such as an alien), as individuals have well-established memories of features of a creature (such as legs) which are hard to disregard.

Further, as the focus of the cognitive perspective has been to explain the mental processes behind creative work, cognitive psychologists have also studied the four stage model described by Wallas (1970/1926). For example, the beneficial effect of an incubation period has been showed empirically (e.g., Sio & Ormerod, 2009). Exactly what happens during the incubation stage is disputed. There have been theories concerning breaking functional fixedness, neural fatigue, new information and unconscious work (Gallate, Wong, Ellwood, Roring & Snyder, 2012; Gilhooly, Georgiou & Devery, 2013). The process of incubation is considered to be, in part, on an unconscious level, where there is a greater chance to combine two memories with low association strengths (Dijksterhuis & Meurs, 2006).

In addition, there have been attempts to explain the illumination stage, the sudden feeling of an 'aha moment'. The sudden nature of the illumination stage is illustrated by the alternative name for the stage (insight), and has contributed to a mystification of the process (Weisberg, 2013). Insight is often preceded by an impasse; that is, the feeling of being stuck (Lehrer, 2008). The impasse has been viewed by some as a prerequisite for the insight; this is the point where one has to break free from previous strategies to reach new solutions to a problem (Ohlsson, 1992). The insight itself is believed to consist of the reconstruction of information and "...seeing the same old thing in a completely different way" (E. K. Miller & Cohen, 2001).

There has been a strong emphasis on divergent thinking in the cognitive view on creativity. However, A. Cropley (2006) argued that convergent thinking is necessary for creative performance. According to A. Cropley (2006), divergent thinking is important for ideation during the incubation and the illumination stages, although convergent thinking also can be used to produce many ideas. A. Cropley (2006) argued that ideas produced by using divergent thinking would be more original than ideas produced by using convergent thinking. Further, convergent thinking is important for preparation and evaluation of the idea. It is by convergent thinking that the usefulness of the idea is assessed (A. Cropley, 2006), and according to the definition of creativity, an idea will not be considered creative unless it has some use or value (e.g., Runco & Jaeger, 2012), as a novel idea or product without purpose would be considered to be pseudo-creative (Cattell & Butcher, 1974).

1.2.3 The biological perspective¹

The biological perspective places emphasis on the activity in different brain regions associated with the creative process and on biological correlates to the creative personality.

A popular belief is that creativity is connected to activity in the right hemisphere, and the right hemisphere is sometimes referred to as the 'creative' hemisphere of the brain (Bogousslavsky, 2005). The right hemisphere is considered to function in a more synthesizing, analogical and intuitive way than the left hemisphere, and the left hemisphere is considered to function in a more logical, abstract and verbal way than the right hemisphere (Theilgaard, 2003). There are research showing a connection between the right hemisphere and creative performance. For example, Martindale (1999) asserted that creative performance is related to a higher activity in the right hemisphere during the work than during baseline conditions. Still, research indicates that creativity depends on the interplay between different regions of the brain, where both hemispheres contributes (Katz, 1997; Sawyer, 2011). In line with this, Carlsson, Wendt and Risberg (2000) found that highly creative participants used both hemispheres during creative work, while low creative participants to a higher extent used mainly the left hemisphere, and Chávez-Eakle et al. (2007) showed that highly creative participants

showed greater activity in several structures of both hemispheres during creative work than average creative participants. Thus, while the right hemisphere seems to be important for creative work, so does the left hemisphere.

Among the areas of the brain that has been investigated in relation to creativity are the frontal lobes. The frontal lobes are considered to be important for executive functioning, and lower activity in the frontal lobes is connected to disinhibition (Pfaus & Pinel, 1989) and decrease of executive functioning (Milner & Petrides, 1984). Martindale (1999) maintained that individuals with highly creative results show a lower frontal lobe activity during creative work, and that the disinhibiting effect of low activity in the frontal lobes would allow for original ideas to emerge. Thus, Martindale (1999) considered that a high creative performance is related to cognitive disinhibition and defocused attention. In line with this, White and Shah (2006) showed that individuals with Attention-Deficit/Hyperactivity Disorder (ADHD) exhibited higher results on a divergent thinking task (the Unusual Uses Task), while individuals without ADHD exhibited higher results on a convergent thinking task (Remote Associates Test). White and Shah (2006) concluded that the low inhibitory control displayed by the individuals with ADHD might facilitate divergent thinking by admission of all concepts and ideas, whereas high inhibitory control might facilitate convergent thinking by the ability to focus at a task for a period of time and by suppressing inappropriate solutions for the task.

However, a decrease of activity in the frontal lobes has not only been associated with enhancement of creative performance, but also with decrease of creative performance (e.g., de Souza et al., 2010). In a comparison between patients with frontal variant of frontotemporal lobar degeneration (fvFTLD) and patients with non-demented Parkinson's disease and healthy controls, de Souza et al. (2010) found that the patients with fvFTLD were impaired on the measures of the Torrance Test of Creative Thinking compared to both control groups. The fvFTLD group showed poorer results than the healthy controls on total score of creativity, verbal creativity and on the subscales fluency, flexibility and originality, as well as on visual creativity and the subscales fluency, originality and creative strengths. The fvFTLD group showed poorer results than the non-demented Parkinson's disease patients on total score of creativity and verbal creativity and on the subscales fluency, flexibility

and originality. The authors concluded that what may appear to be creative responses after frontal lobe damage or deactivation can be seen as involuntary behavior instead. For example, responses with sexual content would be seen as original in the sense that they would be unusual in the large population, but there would not be any real intent behind the response. Thus, the response would not live up to the second criterion of the definition of creativity (see section 1.1.1), and therefore de Souza et al. (2010) labeled this type of responses as 'pseudo-creative'.

Further, Dietrich and Kanso (2010) performed a meta-study of 63 articles in order to examine the popular beliefs about the brain and creativity. They found no support that dominance of the right hemisphere was associated with performance on divergent thinking tasks, but found support for activity in different prefrontal regions (depending on the task at hand). They concluded that there does not seem to be a specific structure of special importance for divergent thinking; many brain regions are involved in divergent thinking, and the demands of the task will decide which regions will be active. In line with this, Sawyer (2011) argued that creativity involves the whole brain, and that the activity in the brain during creative performance is similar to activity during everyday events. Further, the optimal relative activation of different brain regions may be different for different types of creative performance (Sawyer, 2006). Dietrich and Kanso (2010) also asserted that the findings of the combined studies contradicted theories about lower cortical arousal and defocused attention during divergent thinking, as studies measured by electroencephalogram (EEG) pointed towards heightened concentration and alertness. Regarding artistic creativity, there was no evidence for right hemispheric dominance, but there were indications that some types of artistic creativity might be facilitated by activation of prefrontal cortex (PFC), while other types were facilitated by deactivation of PFC (Dietrich & Kanso, 2010). Dietrich and Kanso (2010) did not find right hemispheric dominance for insight problems, but superior temporal gyrus (STG) seems to be associated with the solution of verbal insight problems. Additionally, anterior cingulate cortex (ACC) is activated during insight problem. Thus, the findings on the relation between creativity and prefrontal cortex indicate that prefrontal activity can both have inhibiting and enhancing effects on creativity (Bogousslavsky, 2005). Findings showing a positive relation between frontal lobe activity and creativity are consistent with findings connect-

ing frontal lobe activity with novelty processing (Kiehl, Laurens, Duty, Forster & Liddle, 2001) and error detection (Kiehl, Liddle & Hopfinger, 2000).

1.2.4 The social perspective

The social perspective focuses on the creative place, and thus on the environmental factors that affect creative behavior.

In the social perspective, the individual is influenced by the social context at the group level, organizational level, and society level. According to Sawyer (2006), the social climate affects how creativity is manifested and what types of creative activities are acceptable. Further, it is the social context that decides if a product is or is not creative (Sawyer, 2006). That means that the product's level of novelty and appropriateness is judged by people in the society that are familiar with the specific domain. This is also the underlying assumption for the Consensual Assessment Technique (CAT; Amabile, 1982), where a product is evaluated and scored on creativity measures by experts. CAT is commonly used in research to measure a product's degree of creativity (Kaufman & Baer, 2012). Further, in the social perspective, there is less concern about the individual's innate creative potential, and more concern about environmental factors that will enhance or reduce the probability for creative behavior. Factors that affect the probability for creative behavior include the creative climate (see section 1.1.4, *The creative place*), motivation, creative self-efficacy and evaluation apprehension.

Motivation is viewed as crucial for creative behavior, as motivation concerns the driving force for a behavior. Extrinsic motivation refers to motivation evoked by external factors or outcomes, such as rewards or pay, whereas intrinsic motivation refers to motivation connected to internal satisfaction, such as interest or joy (Ryan & Deci, 2000). Intrinsic motivation has been associated with high levels of creative behavior (e.g., Amabile, 1996). Factors that promote intrinsic motivation, such as interest and joy, will enhance creativity in a long perspective, while factors that promote extrinsic motivation, such as pay or evaluation of a superior can enhance creativity in a short perspective (Amabile, 1996). However, according to Eisenberger and Shanock

(2003), external rewards can be used to enhance intrinsic motivation and creativity by rewarding the process rather than the product.

Self-efficacy refers to the belief that one has the capacity to perform a task (Bandura, 1977), and creative self-efficacy specifically concerns the belief that one has the capacity for creative performance. Research that has investigated the impact of creative self-efficacy on creative performance is extensive. Bandura (1977) stated that high self-efficacy is related to a higher work effort and persistence, and low self-efficacy is related to anxiety and avoidance. Self-efficacy has been shown to be associated with creative performance in several studies. For instance, Furnham and Bachtiar (2008) showed that self-rated creativity correlated with performance of a divergent thinking test, Biographical Inventory of Creative Behaviors, and Barron-Welsh art scale. Tierney and Farmer (2002) explored job self-efficacy, creative self-efficacy and creative performance in employees, and found that creative self-efficacy was significantly related to creative performance and that there was an interaction between job self-efficacy and creative self-efficacy. In a later study, Tierney and Farmer (2011) showed that it is possible to increase employees' creative self-efficacy, by increasing perceived expectations from supervisors, for example, and that increased creative self-efficacy was associated with increased creative performance. Beghetto (2006) found that feedback from teachers was a significant predictor of creative self-efficacy in middle and secondary students, and that students with high creative self-efficacy showed significantly higher participation in after-school activities such as drama and art than students with low creative self-efficacy. Mathisen and Bronnick (2009) measured creative self-efficacy before and after a training program, and found that the training program produced significantly higher creative self-efficacy, while a control group with no training did not show any increase in creative self-efficacy. They also found a correlation between creative self-efficacy and creative performance at the second test session. Thus, a significant amount of research points to the importance of creative self-efficacy for creative performance.

Evaluation apprehension refers to when one expects to be evaluated by someone, and adjust his or her behavior to receive a positive evaluation or to avoid a negative one (Rosenberg, 1965). An evaluative environment is related to a lower degree of creative performance (Amabile, 1996; Byron, Khazanchi & Nazarian, 2010; Jackson & Zedeck,

1982). Evaluation apprehension can also be a reason for efficiency loss in groups (e.g., Paulus, 2000). The effect of evaluation apprehension on creative performance has been explained by higher arousal and by self-censorship in fear of others' reactions.

The mere presence of others has been shown to increase the level of arousal (Bond & Titus, 1983), which facilitates simple behaviors but impedes complex behavior (Bond & Titus, 1983; M. W. Eysenck, Derakshan, Santos & Calvo, 2007). As a result, the presence of others can lead to stereotyped thinking and lower flexibility. The increase of arousal has been linked to evaluation apprehension, and non-threatening conditions have not shown the same increase in arousal (e.g., Dickerson, Mycek & Zaldivar, 2008); the presence of others can even lead to a decrease in arousal if they provide support and stress relief (Mullen, Bryant & Driskell, 1997). Further, a low self-efficacy has been shown to be related to a greater increase of arousal before an audience (Hilmert, Christenfeld & Kulik, 2002).

Self-censorship concerns withholding responses in fear of others' reactions. Parloff and Handlon (1964) connected evaluation apprehension to a lower willingness of sharing ideas, and according to Williams (2002), self-censorship may be a way for individuals to protect their self-esteem if they expect to receive criticism. This conclusion is supported by findings showing that shyness was negatively correlated to creativity only in an evaluative condition, but not in a control condition (Cheek & Stahl, 1986).

1.3 Creative performance and inhibition

There are many people who find it hard to be creative. Some state that they cannot come up with new ideas, whereas others are afraid to express their ideas. This difficulty can manifest itself, for example, during art education, where many may feel restricted. Skoglund (2009) has described that participants in her art courses often start out feeling that they do not know what to do, and feeling uncertain of their own capabilities. The difficulties we meet when we try to be creative can be explained by inhibition.

Inhibition refers to stopping behavior and impulses. In the domain of creativity, inhibition refers to the impeding of creative behavior

and performance. Several factors can inhibit creativity, but this thesis is limited to evaluation apprehension, using specific creativity enhancing techniques, alcohol, and emotional enhancement. Each factor is discussed below.

1.3.1 Evaluation apprehension and social influence on creative performance¹

Evaluation apprehension is a social phenomenon, and is likely to occur when persons interact with each other. Therefore, it is reasonable that evaluation apprehension could occur during group work. Brainstorming in groups is associated with efficiency loss (e.g., Paulus, 2000). Efficiency loss during group work has been related to the expectation that someone else in the group will put in effort ('free riding'), evaluation apprehension, less time per member of the group to express ideas ('production blocking') and usage of convergent thinking (Larey & Paulus, 1999). Diehl and Stroebe (1987) investigated the effect of free riding, evaluation apprehension and production blocking on brainstorming productivity, and they concluded that production blocking was the greatest contributor to efficiency loss in group brainstorming. One strategy for resolving the effect of production blocking is to use electronic brainstorming, which allows group members to interact via a computer (Gallupe, Cooper, Gris  Bastianutti, 1994).

On the other hand, group work might provide a broader knowledge base than individual work, and working in groups provides the possibility for discussions (Stasson & Bradshaw, 1995). Debate and collaboration have been related to creative achievements (Ekvall, 1997; Hunter, Bedell, & Mumford, 2007; Sawyer, 2006). The belief that creative persons prefer to work alone could be a social construct, which individuals adapt to in order to seem creative (Sawyer, 2006). This implies that persons may display characteristics to fit the stereotype of a creative person (such as the stereotype of an 'artist'). In addition, Paulus (2000) argued that working in a group might have other advantages than the creative output, such as developing organizational norms, and that there are strategies that can lessen the efficiency loss in groups.

Many studies have investigated the creative performance by groups and individuals. The results have shown that groups produce

more creative results than the average group member (Ekvall, 1991; Hill, 1982; Restle & Davis, 1962; Taylor, Berry & Block, 1958). However, Plucker, Beghetto and Dow (2004) have stated that the view that group work will enhance creative performance is a myth; when comparing nominal groups (that is, combining the productions of a number of individuals) with interactive groups, the nominal groups show more creative results. In line with this, research has shown that the combined output of a number of individuals will outperform a group with the same number of group members (Ekvall, 1991; Furnham & Yazdanpanahi, 1995; Taylor et al., 1958). Nevertheless, Moore (1997) maintained that high group cohesion can enhance the creative performance for groups, and Stasson and Bradshaw (1995) asserted that an expert can produce more creative results than the group. Further, even though nominal groups produce a larger number of ideas that are also more original, nominal groups do not perform idea selection better than interactive groups (Rietzschel, Nijstad & Stroebe, 2006).

Taken together, previous research indicates that an evaluative social environment would lead to evaluation apprehension (see section 1.2.4, *The social perspective*) and inhibition of the creative performance, whereas a non-evaluative social environment with high cohesion between group members would lead to facilitation of creative performance.

1.3.2 de Bono and creative performance¹

De Bono (1991) claimed that the human brain can be viewed as a self-organizing system that organizes the surrounding world into patterns. This is why it can be difficult to be creative; creativity implies that one can think outside previous patterns. However, de Bono (1994) stated that the brain can be forced to think outside of existing patterns by using creativity techniques. De Bono (1991) argued that the purpose of the creativity technique would be to force one self to think outside existing patterns, and to reach a creative solution in a backwards manner (that is, adapting a solution to the problem rather than searching for solutions). One technique for reaching creative solutions is the *random word technique*, where a word picked at random can be used to transfer the trail of thought from previous patterns, and thereby from conven-

tional responses. De Bono (1994) stated that the technique is supposed to produce new ideas instantly, and de Bono (1991) also maintained that the random word technique is effective for reaching creative solutions. The technique has become popular, and it is presented at numerous sites on the internet (such as *Creating Minds*, n.d.), where people are encouraged to use the technique after reading a brief introduction. De Bono (1994) argued that using a word picked at random would trigger the brain to use divergent thinking, as the individual would have to try to figure out an association between the problem and the word, thereby avoiding the conventional associations of a steep associative hierarchy.

There are a few studies attempting to investigate the effectiveness of de Bono's techniques. Rosenthal, Morrison and Perry (1977) showed that the practical lessons on de Bono's techniques gave a greater improvement on creativity measures than attending lectures on creativity. However, Rosenthal, Morrison and Perry (1977) did not use any control condition; both groups were taught creativity techniques, either by participating in lessons or by attending lectures. Tripp (1980) showed that pupils produced a greater number of ideas of higher quality after attending a training program constructed by de Bono. However, Tripp (1980) argued that the improvement could in part be explained by practice at making balanced arguments. Further, Goldenberg, Mazursky and Solomon (1999) investigated the effect of random stimulation, lateral thinking and templates (using existing solutions in other areas) on divergent thinking tasks. The templates group produced higher scores on originality and value than the lateral thinking group and the random stimulation group. However, the random stimulation group and the lateral thinking group demonstrated higher fluency. Considering that originality and value are requirements for creativity while fluency is not, lateral thinking and random stimulation therefore showed less creative results. In addition, Kilgour and Koslow (2009) investigated use of random word (as a divergent thinking technique) and priming of information (as a convergent thinking technique) among samples of advertising creatives and account executives. They found that the groups differed with regard to originality and appropriateness; the divergent thinking technique was related to a higher degree of originality for the executives, but not for the creatives, and the convergent thinking technique was related to a higher degree of appropriateness for the crea-

tives. Kilgour and Koslow (2009) concluded that creativity techniques are no universal way for enhancing creativity.

In summation, even though de Bono's creativity techniques are popular, there is little evidence that they are effective. The results of Kilgour and Koslow (2009) even suggest that the random word technique in some cases might inhibit creative performance.

1.3.3 Alcohol and creative performance¹

The popular belief seems to be that alcohol will facilitate creative performance. A search on Google (29 July 2015), with 'positive effect alcohol creativity' as the search string, rendered about 41,000,000 number of hits, while the search string 'negative effect alcohol creativity' rendered about 33,000,000 number of hits. There have been a number of studies that investigated the effects of alcohol on creative performance and thinking style, of which some have found positive effects of alcohol on creativity. Jarosz, Colflesh and Wiley (2012) tested the effect of alcohol on creative performance and found that the alcohol group (with mean blood alcohol content of 0.075) solved the items of the Remote Associates Task in a shorter time than the control group, and that the alcohol group rated themselves as more insightful. However, they did not use a placebo group, so there was no control over expectancy effects. Hajcak (1976) also investigated the effect of alcohol on creativity and found that alcohol induced more original performance, but less creative problem solving. Hajcak (1976) stressed that a relaxing setting is of importance for more original associations to occur. Norlander and Gustafson researched the effect of alcohol (1.0 ml of 100% alcohol per kg bodyweight) on the different stages of the creative process in several studies. They found that alcohol was related to higher incubation score (Norlander & Gustafson, 1996), lower flexibility and higher originality in the illumination stage (Norlander & Gustafson, 1998) and inhibition of the verification stage (Norlander & Gustafson, 1997). Based on the results, Norlander and Gustafson suggested that alcohol stimulates primary process and obstructs secondary process. Gustafson and Källmén (1989a, 1989b) found that primary process thinking was equal, while secondary process thinking was reduced, after ingestion of alcohol (1.0 ml of 100% alcohol per kg bodyweight). In a later study, Gustafson

and Källmén (1990) found no effect of alcohol on performance of the Stroop's Color Word Test, and they concluded that secondary process was not being hindered by alcohol; rather, there were indications that secondary process thinking was stimulated by alcohol, as the men in the alcohol group took longer time to complete the task which is considered to be primary-process-oriented. In addition, Kastl (1969) found that participants that consumed an intermediate dose of alcohol showed more conventional associative thoughts.

One explanation for the results reported above is changes in the regional cerebral blood flow. Sano, Wendt, Wirsén, Stenberg, Risberg and Ingvar (1993) showed that low doses of alcohol (corresponding to 0.89 ml per kg body weight) are related to an increase in the blood flow in the prefrontal cortex, while larger doses (corresponding to 1.91 ml per kg body weight) are related to a decrease in the blood flow in the prefrontal cortex. Since alcohol will affect prefrontal areas of the brain, executive functioning will decrease under the influence of alcohol. This is the argument for why one should be more creative under the influence of alcohol: one would be less inhibited. Nevertheless, studies have shown that the prefrontal lobes are important for the creative ability (de Souza et al., 2010), and this has also been demonstrated with regard to alcohol. Montgomery, Ashmore and Jansari (2011) tested an alcohol group (modest level of alcohol, 0.4 g per kg body weight) and a placebo group with regard to executive functioning and prospective memory, and found that the alcohol group performed more poorly on the planning, prioritization, creativity and adaptability executive subscales of the Jansari–Agnew–Akesson–Murphy task. However, no control group was included in the study. The authors concluded that even moderate doses of alcohol – so small that the person may not even consciously recognize him or herself as intoxicated – can affect executive functioning. Further, studies have shown that visual priming to an alcohol condition could affect cognitive functioning (Hicks, Friedman, Gable & Davis, 2012) and creative performance (Hicks, Pedersen, Friedman & McCarthy, 2011). The effect was related to the degree to which the participants expected alcohol to have effect on creativity. The authors concluded that expectancy alone can alter thoughts and behavior. These studies point to the conclusion that alcohol alone decreases creative ability unless one expects to become more creative under the influence of alcohol.

Further, it is well established that alcohol increases risky behavior. Lane, Cherek, Pietras and Tcheremissine (2004) showed this effect in an experiment, and further found indications that the effect might be explained by alcohol-induced participants becoming oversensitive to past rewards, while also becoming under-sensitive to experienced losses during the experimental trials. Fromme, Katz and D'Amico (1997) performed two experiments, and found that participants in alcohol conditions perceived less negative outcomes on risky situations than participants in control conditions. Also, there are indications that the effect of alcohol may interact with self-efficacy on future behavior (Davis, Masters, Eakins, Danube, George, Norris & Heiman, 2014). Seeing that self-efficacy regards the perception that one can succeed with the task at hand (Bandura, 1977), it seems possible that alcohol can alter the perception of competence, resulting in more positive expectations of the outcome. This could also be a possible effect of alcohol on creative performance, as several studies have shown a relationship between self-efficacy and creative output (Furnham & Bachtiar, 2008; Tierney & Farmer, 2002; Tierney & Farmer, 2011).

Alcohol may also affect social interactions, as it affects the amygdala in a way that reduces social anxiety (Sripada, Angstadt, McNamara, King & Phan, 2011) and reduces the bilateral insula activation, leading to less attentiveness to emotional facial expressions (Padula, Simmons, Matthews, Robinson, Tapert, Schuckit & Paulus, 2011). Higgins and Stitzer (1988) found that alcohol increased the amount of speaking, even though performance on a non-verbal task decreased. Freeman, Friedman, Bartholow and Wulfert (2010) even found signs of social disinhibition in an alcohol priming design, but the difference between the experiment group and the control group was only evident in an evaluative condition.

Taken together, these findings imply that the performance on a creative task may be impeded by alcohol, while impact of evaluation apprehension may be lessened. The positive effects of alcohol on creative performance showed in some studies and held in popular belief could in that case be related to an increased willingness to communicate ideas, rather than an improved creative ability.

1.3.4 Negative affect and creative performance

Emotional states have been related to a higher arousal than neutral states (e.g., Silvert, Delplanque, Boulwalerh, Verpoort & Sequeira, 2004), which can affect performance. High arousal has been connected to impediment of complex behavior (Bond & Titus, 1983; M. W. Eysenck et al., 2007) and stereotyped thinking (Eysenck, 1997).

Negative affect has been connected to avoidance and impairment of performance (Hunt & Ellis, 2004). M. W. Eysenck et al. (2007) proposed that anxiety can affect performance by inducing usage of stimulus-driven attention. This makes the individual more easily distracted, particularly by threatening stimuli. One effect of this is that the individual will become less attentive to a task, which in turn will impair efficient cognitive processes. However, if the individual increase the work effort, the performance does not have to be impaired.

On a biological level, cognitive and emotional task may involve different parts of the brain, and Bush, Luu and Posner (2000) argued that cognitive tasks reduce the activity of the emotional areas of the cingulate cortex, and that emotional tasks reduce the activity of the cognitive areas of the cingulate cortex. One negative emotion is anxiety, and Hodges (1968) showed that failure can induce anxiety. Therefore it is reasonable that failure on a task would negatively affect succeeding cognitive tasks.

Although research indicates that negative affect impairs performance, studies investigating the effect of negative emotion on creative performance have shown conflicting results. There have been studies performed where no effect of negative affect on creative performance was found (e.g., Fernandez-Abascal & Díaz, 2013; Grawitch, Munz & Kramer, 2003), while other studies showed that negative emotion can enhance creative performance under certain conditions (George & Zhou, 2002). Byron and Khazanchi (2011) found in a meta-study that negative emotion impaired creative performance, and de Acedo Baquedano and de Acedo Lizarrage (2012) found a negative relation between anxiety and creative performance. In addition, individuals in a happy mood have been shown to produce more responses on a creative task than individuals in a sad mood, although the difference disappeared if instructions that all responses were acceptable were applied (Gasper, 2004).

1.4 Rationale of the investigation

Creativity is a complex concept. In order to more fully comprehend what can inhibit the creative performance, it is important to consider the different aspects of creativity and different perspectives for explaining creativity. To investigate all aspects and perspectives on creativity was beyond the scope of this thesis, but studying several aspects was still considered important. Investigating different samples was also considered important; thus, the samples of the studies comprised in this thesis consisted of students as well as professionals. Further, creativity is a concept that is hard to measure. In this thesis, creative performance has been measured using different types of divergent thinking tests; although divergent thinking tests have been criticized and their results cannot be equaled with creativity, such tests are still used as a measure of creative potential.

The purpose of this thesis was twofold: the first purpose was to manipulate conditions in order to alter cognitive processes and to measure creative performance; the second purpose was to investigate how evaluative situations affect perceived and measured creative performance. From this general rationale, four studies were designed. Studies I and II were designed to test creative performance after manipulations of conditions, and Studies III and IV were designed to investigate perceived and measured creative performance in evaluative situations.

The areas of interest for the studies were chosen based on theoretical notions of possible mechanisms behind the effect of groups on performance. The literature review of the introduction has shown that social situations can induce arousal, which can obstruct complex behavior. Affect is also connected to an increase of arousal, and can accordingly also obstruct complex behavior. Further, alcohol functions by decreasing the activity of the prefrontal lobe, which is important for higher cognitive functions, and thereby it can also obstruct complex behavior. Hence, both alcohol and affect can decrease executive functioning, which in turn can affect creative performance. In addition, social influence can increase self-censorship of ideas via evaluation apprehension, whereas alcohol has been shown to increase impulsiveness and willingness to speak. Further, negative affect has been associated with avoidant behavior, which could be related to less willingness to com-

municate with other people. Thus, even though alcohol, affect and evaluation apprehension may seem disparate, they affect similar functions with regard to creativity.

The rationale of the investigation is outlined below.

Study I comprised of two experiments. The overall aim was to investigate the effect of group work and an explicit creativity technique on creative performance. In experiments 1 and 2, the effectiveness of group work and de Bono techniques on creative performance were examined. In experiment 3, the impact of group work and one of de Bono's techniques on the creative process were investigated.

Study II comprised two experiments. The overall aim was to investigate the impact of manipulation of executive functioning on creative performance. In experiment 1, the impact of alcohol on primary process, secondary process and creative performance was investigated, and in experiment 2 the impact of emotional enhancement on primary process, secondary process and creative performance was examined. Study II concerned a more individualistic and biological approach to creative performance.

As the arousal-enhancing film material of Study II did not impair creative performance, the effect of negative affect was questioned. A preliminary, unpublished experiment with 43 participants took place in order to further investigate the effect of negative affect – more specifically the effect of failure – on creative performance. The design was chosen on the basis that failure is more connected to a personal threat than an emotional-enhancing film material, and thus might be associated with a larger effect on creative performance. The results of the unpublished study did not show any impairment of the creative performance for the Failure group, but women in the Failure group were less content with their performance during the testing than women in the Control group. This led to questions regarding the impact of negative affect on the creative process, as the impact seemed to relate to the thoughts and feelings about one's performance rather than to impact the performance itself. Therefore, the second purpose of the thesis was developed: how evaluative situations affect perceived and measured creative performance. More specifically, Study III was designed to further investigate how participants experience working on a creative task after receiving negative feedback.

Study III was comprised of eleven interviews. The overall aim was to investigate subjective experiences and feelings during creative work after receiving negative feedback on a previous task; that is, how respondents perceived the situation to work on a creative task during negative affect. Study III concerned the individuals' experiences of the creative process after inducement of negative affect.

The results of Study III indicated evaluation apprehension as a possible inhibiting factor on creative performance. However, as Study III was conducted with a qualitative method with a very small sample, it would be problematic to draw any general conclusions based on the results. Therefore, Study IV was designed to test the prediction that evaluation apprehension has a negative relation to creative performance on a larger sample.

Study IV comprised two surveys. The overall aim was to investigate fear of evaluation in relation to both creative self-efficacy and creative performance. Study IV concerned the creative place, evaluation apprehension and real-life creative performance in working life.

In sum, the overall advancement of the investigation started with three areas which would affect creativity from a theoretical view, namely alcohol, negative affect and evaluation apprehension. In Study I, the impact of working in groups and different levels of instructions were tested, and in Study II, the impact of alcohol and emotional enhancement were tested. To better understand the results of Study II and a subsequent unpublished study, which were produced in experimental settings, qualitative interviews were conducted in Study III in order to explain the effects of the previous studies. This was the reason for choosing an experimental background for the interviews; the aim was to understand how the participants comprehended the experimental situation, and how they felt and thought during the experimental situation. The findings of the qualitative study were then the starting point for the design of the survey study, since the qualitative study did not provide a sufficiently large sample to draw general conclusions.

¹ This section is a development and expansion of a previous text (Svensson, 2010).

2. The present investigation

2.1 Introduction

In the following four studies, a total of 476 participants took part in five experiments, one interview study and two surveys. It was considered important to use several types of methods and samples in order to obtain a more thorough investigation on inhibition of creative performance. **Study I** describes three experiments, with samples consisting of 42, 60 and 94 participants, concerning the effect of group work and creativity enhancement techniques on creative performance. Data has also been presented in student theses (Svensson, 1999 for Experiment 1; Ohlsson, 1999 for Experiment 2; and Svensson, 2001 for Experiment 3). **Study II** describes two experiments, with samples consisting of 48 and 40 participants, concerning the effects of alcohol and emotional-enhancement on creative performance and primary-secondary process relations. The data collection of Experiment 2 was performed by R. Granbom and M. Solberger. **Study III** describes interviews with 11 respondents on their thoughts and feelings during creative work after problem-solving failure. The aim of Study III was to investigate how individuals react to failure and how that reaction is manifested with regard to creative performance. **Study IV** describes two survey studies, with samples consisting of 82 and 99 participants. Study IV investigated the relation of fear of negative evaluation and self-assessed performance as well as actual performance in response to a fabricated creative scenario. The data of Survey 2 has also been presented in a student thesis (Ritter von Kogerer, 2015).

2.2 Study I: Effects of individual performance versus group performance with and without de Bono techniques for enhancing creativity

General aim

The overall aims of the three experiments were to examine individual work and group work with regard to creative performance (Experiment 1), the effect of the random word technique and the provocation technique on ideation (Experiment 2) and the creative process during individual work compared to group work with or without the random word technique (Experiment 3).

2.2.1 Experiment 1

Design

The participants were allocated to two experimental groups (Assemblage), where 21 participants worked individually (Single-work) and 21 participants worked in three groups with seven participants in each group (Group-work). The dependent variables were fluency, flexibility, total score of originality (originality-quantity) and originality score corrected for number of solutions (originality-quality).

Participants

Forty-two students, 21 males and 21 females, participated in the experiment. Participants were recruited at Karlstad University.

There were no significant differences between the groups with regard to background variables or attitude to change and stability (as measured with the test Change and Stability; "Förändring och Stabilitet" in Swedish).

Instruments

Pre-experimental questionnaires

- i. *Demographics*. A demographics survey containing questions regarding age, hometown or place one grew up, home residence, civil status, cultural background, preference for working alone or in a group, the extent to which the participant considered himself/herself willing to ponder over different possibilities, self-estimated spontaneity, self-estimated degree of logical thinking, and the extent to which the participant remembered his/her dreams was applied.
- ii. *FS - Change and Stability* [Förändring och Stabilitet]. An attitude to change and stability test consisting of 20 items (Holmquist 1986) was used. The participants were asked to respond on a four-point scale, ranging from agree to disagree.

Independent variable

- i. *Assemblage*. The participants worked either as individuals (Single-work) or in groups of seven participants (Group-work).

Dependent variables

- i. *PUKORT*. A shortened, Swedish version (Holmquist, 1970) of the Purdue Creativity Test was used. The shortened version (PUKORT) contains pictures of 10 fictitious items, and the participants' task was to describe as many uses for the objects as possible. Participants were allowed to work two minutes per item, and the test took 20 minutes to complete. The *fluency* score was obtained through a summation of all responses. The *flexibility* score was obtained by an analysis of the number of different categories, which was performed by a panel of two judges (Panel A). The *originality* score was graded by another panel of two judges (Panel B), who graded the responses with regard to originality on a scale from 1 to 10. Two measures of originality were used in the experiment: (1) the summated score of for all items (originality-

quantity) and (2) the summation of the highest originality scores for every item (originality-quality).

Procedure

First of all, participants completed a questionnaire on background data and the FS. Participants belonging to the Single-work condition were then required to work on PUKORT alone. Participants belonging to the Group-work condition were placed together as a group, and the group collaborated on the work on PUKORT.

Statistics

Inter-judge reliability (Panel A and Panel B) was examined by application of correlational statistics (Pearson's r). Background data, FS and the dependent variables were analyzed by application of Mann-Whitney U tests. The participants' result on the FS was compared with a norm group by application of a one-sample t-test. Further, the total scores of the individuals in the Single-work condition were compared with the total scores of the Group-work condition through one-sample t-tests.

Results

Single-work versus Group-work

There were significant differences between the groups with regard to fluency, flexibility and originality-quantity. The Single-work group displayed lower scores than the Group-work groups on all these variables. However, there was no significant difference between the groups with regard to originality-quality.

The results show that group work produced more responses, used more categories in their responses and produced more original responses. However, the total score for originality (Originality-quantity) is strongly related to fluency, as a higher fluency will enhance the chance

for a high originality score. When controlling for fluency by looking at the sum of the single highest score of originality for all items (Originality-quality), there was no difference between the Single-work group and the Group-work group. As fluency is not a requirement for creativity, Originality-quality is a more valid measurement with regard to creative performance.

Nominal groups versus Real groups

The summated results of the individuals were compared with the summated results of the groups. There were significant differences between Single-work and Group-work with regard to fluency, flexibility, originality-quantity and originality-quality. The Single-work group displayed higher scores than the Group-work groups on all these variables.

The results implicate that nominal groups produced higher scores on every measure of creative performance.

In summation, the results of Experiment 1 support previous research showing that a group outperforms an individual, but that a number of individuals outperform a group with the same number of group members.

2.2.2 Experiment 2

Design

Participants were randomly assigned into one of three experimental conditions: a Control condition, a Random word condition and a Provocation condition. There were 20 participants in each group. The Between-Subjects effect was determined by Group (control, random word and provocation), and the Within-Subject effect was determined by Fluency (pre-fluency and post-fluency).

Participants

The participants were recruited from high school pupils in Sweden. In total, 60 pupils participated (55 girls and five boys). There were no significant differences between the groups with regard to background variables or attitude to change and stability.

Instruments

Pre-experimental questionnaires

- i. *Demographics*. A demographics survey containing questions regarding age, number of interests, type of interests, and region where one grew up was applied.
- ii. *FS*. See section “Instruments”, Experiment 1.

Independent variable

- i. *Technique*. A control condition and two different manipulations were used to investigate the effect of creativity enhancement techniques. For the control condition, the *DOT test* (Sjöborg, Frömark & Gamberale, 1977) was presented instead of the instructions for the creativity techniques. This was done in order to hinder a “creative pause.” The DOT test took five minutes to complete, and required the participants to mark four-dot formations among a large number of three- or four-dot formations. For the random word group, a *Random word generator* was used. The generator contained 50 words picked at random from a dictionary. For the Provocation group, a *Provocation* was used. The provocation was attained by combining the original problem with the question: How does one get people not to eat at home?

Dependent variables

- i. *The creative problem.* The following problem was used: “Herman Andersson has bought a restaurant but few clients came. What should he do to induce more clients to eat at his restaurant?” The participants worked with the problem for 10 minutes before the manipulation and 10 minutes after the manipulation. The participants were instructed to write down as many solutions on the problem that they could think of. *Fluency* (total number of relevant responses) was measured before (pre-fluency) and after (post-fluency) the manipulation. The fluency score was obtained through summation of all the responses.

Procedure

The participants completed a questionnaire on background data and the FS-test. Then the instruction to the creative problem was read aloud and participants began working on the problem. After 10 minutes, participants were interrupted. At that time, the control group was instructed to work with the DOT-test for five minutes, the random word group received a word from the random word generator and the provocation group received the provocation. The random word group and the provocation group also received instructions on how a random word or a provocation can be used when working on a problem. The procedures and instructions for the random word group and the provocation group took five minutes. Thereafter, all three groups continued to work on the creative problem for an additional 10 minutes.

Statistics

Background data was analyzed by application of Kruskal-Wallis tests with Group as independent variable. The FS-score was analyzed by application of a one-way ANOVA with Group as independent variable.

The participants' score on FS was compared with a norm group by application of a one-sample t-test. A split-plot ANOVA with Group as Between-Subjects Factor and Fluency (Pre-fluency, Post-fluency) as Within-Subjects Factor was applied.

Results

There was no significant difference between the Groups, but there were significant effects with regard to Fluency and a significant Groups x Fluency interaction effect. Further analysis showed that pre-fluency was higher compared to post-fluency. Paired Samples t-tests showed that pre-fluency scores were higher as compared to post-fluency scores for the Random word and Provocation conditions, while there was no significant difference between pre-fluency and post-fluency scores for the Control condition.

The results indicate that the two creativity techniques did not immediately give rise to new ideas; rather, fewer ideas were produced after the instructions. This effect was larger for the random word technique (Cohen's $d=2.47$) than for the provocation technique (Cohen's $d=1.33$), but both effect sizes are considered to be large.

2.2.3 Experiment 3

Design

The independent variables used were Assemblage (Single-work or Group-work) and Technique (with or without random word). The participants were allocated to one of four conditions: individual work without random word (eight participants), individual work with random word (eight participants), group work without random word (eight groups; 39 participants) and group work with Random word (eight groups; 39 participants). The groups in the two group work conditions consisted of five participants, with the exception of two groups that consisted of only four participants. The dependent variables measured were fluency, originality, flexibility, assertions, thought changes, incubations, and illuminations.

Participants

The experiment was performed at Karlstad University, Sweden. Ninety-four persons participated in the experiment: 46 males and 48 females. All participants were students of the university.

Instruments

Pre-experimental questionnaires

- i. *Demographics*. See section “Instruments”, Experiment 1.
- ii. *FS*. See section “Instruments”, Experiment 1.
- iii. *Life Orientation Test (LOT)*. The test measures dispositional optimism (Scheier & Carver, 1985), and consists of 12 items (four of which are filler items) of the type: “In uncertain times, I usually expect the best.” Participants responded on a five-point scale, ranging from zero (strongly disagree) to four (strongly agree).

Independent variable

- i. *Assemblage*. Participants worked either as individuals (Single-work) or in groups with five participants (Group-work).
- ii. *Technique*. A control condition and a random word condition were used.

Dependent variables

- i. *The creative problem*. The participants were instructed to plan an experiment to investigate the relative importance of heredity and environment (adapted from Patrick, 1938 and Norlander & Gustafson, 1996). Every individual in the Single group condition produced three records: Original report, Diary and Final report. Every group in the Group-work condition produced seven records: one Original report, five Diary reports (one for each group member) and one Final report. The records were scored by two panels. Panel A scored all records with regard to stages of the creative

process; the panel assessed the frequencies and locations of assertions, thought changes, incubations, and illuminations. Assertions and thought changes are associated with the preparation stage of the creative process, incubations with the incubation stage, and illuminations with the illumination stage. Panel B assessed the Final reports with regard to fluency, flexibility and originality.

Procedure

The experiment was performed over a three-day period. Participants attended meetings in the laboratory on the first and the third day. On the first day of the experiment, participants were randomly assigned to one of two conditions: Random word or Control. After that, they were asked to complete a questionnaire on background data, the LOT and the FS. The participants in the group-work condition were instructed to work together on the following task (that is, the creative problem). After that, the creative problem was presented to the Control group. Participants then talked aloud about the problem for five minutes. Before the creative problem was presented to the Random group, participants were instructed about how one can use a random word when working with a problem. After that, the creative problem was presented to the Random word group, and a word was picked from the random word generator by the individual (Single-work) or a member of a group (Group-work). Then participants talked aloud about the problem for five minutes. All participants were audio-recorded, and the recordings constituted the original reports. After that, participants received the diary, and they were instructed to write down thoughts on the problem in the diary and that they would return the diary the last day of the experiment. The Random word group also received instructions to read additional random word at home on the next day. All members of a group received the same random word.

When participants attended the meeting on the third day, they were asked to talk aloud about their solution on the creative problem for five minutes. This was again audio-recorded, and the recordings constituted the final reports. Finally, the diaries were collected.

Statistics

Background data, LOT, and FS were analyzed by application of two-way ANOVAs with Assemblage and Technique as independent variables. One-sample t-test was used to compare participants' score on FS to a norm group. The inter-judge reliability (Panel A and Panel B) was examined by application of correlational statistics (Pearson's r). In order to analyze the markers of the creative process (that is, assertions, thought changes, incubations and illuminations) in the original report, the diary and final report, Pillais' MANOVA (2 x 2 factorial design) with Assemblage and Technique as independent variables was used, and this was followed up by univariate F-tests. Fluency, flexibility and originality of the final report were analyzed with two-way ANOVAs with Assemblage and Technique as independent variables. In order to compare the mean fluency for individuals in Single-work condition and individuals in Group-work condition, a one-sample t-test was used.

Results

Stages of creative thought

There was no interaction between Assemblage and Technique, and no significant effect with regard to Technique, but there was a significant effect with regard to Assemblage. The significant results for the univariate F-tests are shown below.

Technique. There was a significant difference between the groups with regard to thought changes in the diary, where the Random word group displayed a higher degree of thought changes compared to the Control group.

Assemblage. There were significant differences between the groups with regard to assertions, thought changes, and incubations in the original report. The Single-work group displayed a higher degree of assertions in the original report than the Group-work groups, while Group-work groups demonstrated more thought changes and incubations in the original report than the Single-work group.

There were significant differences between the groups with regard to thought changes, and incubations in the diary. Group-work groups displayed a higher degree of thought changes and incubations in their diaries compared to the Single-work group.

There were significant differences between the groups with regard to thought changes, incubations and illuminations in the final report. The Single-work group displayed a higher degree of illuminations in the final report than the Group-work groups, while Group-work groups displayed a higher degree of thought changes and incubations in the final report than the Single-work group.

In summary, the results showed that the Group-work group produced higher scores on thought change and incubation throughout all records of the experiment, whereas the Single-work group produced higher scores on assertion for the original report and illumination on the final report. The Random word group produced higher scores on thought change in the diaries than the Control group.

Creativity of the finished plan

Fluency, flexibility and originality of the final report were analyzed with two-way ANOVAs with Assemblage and Technique as independent variables. The Group-work group displayed higher degrees of fluency and originality than the Single-work group and the Control condition displayed a higher degree of flexibility than the Random word condition.

In addition, the Single-work group was compared with the Group-work group regarding the summated fluency score in the Final report. Together, the 16 groups produced 85.50 ideas, and the 16 individuals produced 38.00 ideas altogether. This means that participants in the Group-work condition produced 1.07 ideas on average and the individuals produced 2.38 ideas on average, and a one-sample t-test showed that the Group-work condition produced significantly less ideas on average.

In summary, the Group-work condition showed higher fluency and originality. Still, the individuals showed a greater mean value on fluency. The Random group showed a lower flexibility score than the participants in the Control group.

The results provide support for previous research showing that a group outperforms an individual, but that a number of individuals outperform a group with the same number of group members. In addition, the results did not support the notion that the random word technique would produce more creative results.

2.3 Study II: A Swedish version of the Regressive Imagery Dictionary: effects of alcohol and emotional enhancement on primary-secondary process relations

General aim

The aim of the study was to apply the Swedish version of the Regressive Imagery Dictionary (RID) and to investigate creative performance under the influence of alcohol (experiment 1) and enhanced emotionality (experiment 2).

2.3.1 Experiment 1

Design and Drinks

A 3 * 2 factorial design was used with Drink (Control, Placebo and Alcohol) and Gender (Men and Women) as independent variables. Dependent variables were Unexpected events, Imagination, Realism, Logical plot, Original primary process, Revised primary process, Original secondary process and Revised secondary process.

Participants

The experiment was conducted at Karlstad University, and participants were recruited on campus. Forty-eight students (24 men and 24 women) participated. There were no significant differences or interactions between the experimental groups and gender with regard to background data, with the exception of weight, where the men weighted more than the women. In addition, there were no significant differences

or interactions between the experimental groups and gender with regard to fluency and originality, as measured with the Dramatic Events test.

Instruments

Pre-experimental questionnaires

- i. *Demographics*. A questionnaire containing questions regarding age, weight, self-reported alcohol consumption, cultural background, and female participants' menstrual status and intake of contraceptive pills was used to obtain background data.
- ii. *Dramatic Events test (DET)*. The test (Guilford, 1967; Norlander, Bergman & Archer, 1998) measures divergent thinking. The test consists of six fictitious situations of the type "Imagine that a glacial period would occur." Participant completed three of the situations. The *fluency* score was obtained by summation of all the responses. In addition, a panel of two judges (panel A) classified the responses as either *usual* or *unusual*. The *originality* score was obtained by summation of the unusual responses provided by a participant.

Independent variable

- i. *Drink*. Three different drinks were used. The Control group was given a drink of 5.0 ml tonic water (Schweppes) per kg bodyweight; the Placebo group was given a drink of 5.0 ml tonic water per kg bodyweight plus 17 ml vodka essence (Saturnus) and a few drops of vodka smeared on the inside of the glass; and the Alcohol group was given a drink of 1.0 ml of 100 percent alcohol per kg bodyweight (in the form of Absolut Vodka, 40 percent by volume), mixed with an identical volume of tonic water.

Dependent variables

- i. *The creative task*. The creative task was adapted from Martindale and Daily (1996), and read: “A man and woman meet and go out on a date. Tell what led up to this, what the characters do, what they are thinking and feeling, and what happens afterwards.” The participants were asked to write a narrative based on the information in the creative task. The participants had a time limit of 20 minutes for writing the narrative. Participants received instructions to be imaginative and to keep writing until the time was up. The stories were scored by a panel of three judges (panel B) on a scale from 0 to 10 with regard to four measurements: Unexpected events (to what degree events in the story were surprising), Imagination (to what degree the story was imaginative), Realism (to what degree the story was lifelike), and Logical plot (to what degree the story had a reasonable line of events). In addition, a computerized content analysis, based on the Regressive Imagery Dictionary, was performed on the stories, yielding the percentage of primary and secondary process content.
- ii. *Regressive Imagery Dictionary (RID)*. The RID (Martindale, 1975) is a wordlist, listing words belonging to the categories *primary process* and *secondary process*. The RID was translated to Swedish (Norlander, Linnarud, Kjellén-Simes & Hogenraad, 2003). The original Swedish translation (original RID) consists of 7564 words; this translation was revised (revised RID) by adding synonyms, adding separate entries for different inflectional endings of words and removing words with more than one meaning. The revised RID consists of 12,280 words. All stories were analyzed with both the original and the revised RID using the computer program *Simstat for Windows*, yielding scores of primary and secondary process content.

Procedure

Upon arrival at the laboratory, participants provided a breath sample for breath alcohol analysis. Participants were weighed and randomly assigned to the Control group, the Placebo group, or the Alcohol

group. Then, the participants completed the questionnaire on background data and the DET. Then the participants received the drink. The participants had to consume the drink in 20 minutes, and after that they had to wait 15 minutes. Thereafter, a second breath analysis was conducted, and the participants received the instructions for the creative task and wrote a narrative. Finally, the participants performed a third breath analysis.

Statistics

Inter-judge reliability was analyzed by correlational statistics. Pearson's r was used to analyze the inter-judge reliability of Panel A, while inter-item analysis was used to analyze the inter-judge reliability of Panel B. Two-way ANOVAs with Drink and Gender as independent variables were applied to background data, the DET, and the dependent variables. For post-hoc comparison, Tukey's test ($p < 0.05$) was used.

Results

There were no significant differences between the Experimental groups or Gender, and no interaction effects, with regard to original primary process, original secondary process, revised primary process, or revised secondary process. There were no Gender differences with regard to degree of unexpected events, imagination, realism, or logical plot. There was a significant difference between Experimental groups with regard to unexpected events, imagination and realism. The Alcohol group demonstrated a lower degree of unexpected events and imagination than both the Control group and the Placebo group and a higher degree of realism than the Placebo group. There was no significant difference between the Experimental groups with regard to logical plot, and no significant interaction effects between Experimental group and Gender with regard to imagination, realism, or logical plot. However, there was a significant interaction effect with regard to unexpected events. The men in the Placebo group demonstrated a higher degree of unexpected events than the women in the Placebo group and the men in the Alcohol condition. Also, the women in the Control condition

demonstrated a higher degree of unexpected events than the women in the Alcohol condition.

2.3.2 Experiment 2

Design

A 2 * 2 factorial design was used with Film (Neutral or Action) and Gender (Men or Women) as independent variables. The dependent variables were Aggressiveness, Destructiveness, Sexual content, Originality, and Literary quality.

Participants

The experiment was performed at Karlstad University. Forty participants (20 men and 20 women) were recruited on campus. All participants were born and raised in Sweden. The participants were randomly assigned to two film groups, where 10 men and 10 women participated in each film condition. There were no differences between experimental groups or gender with regard to background data.

Instruments

Pre-experimental questionnaires

- i. *Demographics.* A demographics questionnaire was applied containing questions regarding age, place one grew up and home residence.

Independent variable

- i. *Films.* Two different films were used to investigate the effect of emotional-enhancing film material: one action film and one neutral film. 'Sunset Boulevard' (Brackett & Wilder, 1950) was used

as action film. The film contains dramatic and action-filled scenes. 'La Cérémonie' (Karmitz & Chabrol, 1995) was used as neutral film. The film contains long episodes of everyday events.

Dependent variables

- i. *Narratives*. The participants were asked to write down how they thought the film they had seen would end. The narratives were scored by two panels of judges. Panel A assessed the degree of Aggressive, Destructive, and Sexual content in each narrative on a scale from 0 to 10. Panel B assessed the degree of Originality and Literary quality on a scale from 0 to 10.
- ii. *RID*. See section "Instruments", experiment 1.

Procedure

None of the participants had watched either of the two films used in the experiment. Participants were randomized to one of the experimental groups. After this, each participant watched a 30-minute episode from the appropriate film. Finally, the participants were asked to write down how they thought the film they had seen would end. Participants had 10 minutes to write the narrative.

Statistics

Background data variables were analyzed by application of Mann-Whitney tests with Film and Gender as independent variables. The dependent variables and age were analyzed by application of two-way ANOVAs with Film and Gender as independent variables. For post-hoc comparisons, t-tests ($p < 0.05$) were applied. Inter-judge reliability (Panel A and Panel B) was examined by application of correlational statistics (Pearson's r).

Results

Two-way ANOVAs showed no differences between the Film groups or Gender with regard to Aggressiveness, Destructiveness, Sexual content, Originality, or Literary quality, and no interaction effect with regard to Aggressiveness, Destructiveness, Originality, or Literary quality. There was an interaction effect between Film groups and Gender with regard to Sexual content, where the women in the Neutral group demonstrated a lower degree of Sexual content than the women in the Action group.

A two-way ANOVA showed no gender difference and no interaction effect between film groups and gender with regard to original primary process or revised primary process. There was however a significant difference between the film groups with regard to both original primary process and revised primary process, where the Action group demonstrated a higher degree of primary process content than the Neutral group. A two-way ANOVA showed no differences between the film groups or gender regarding original secondary process or revised secondary process, and no interaction effect between film groups and gender regarding original secondary process or secondary process.

2.4 Study III: Subjective Experiences of Creative Work after Negative Feedback

General aim

The overall aim of the study was to explore the impact of frustration on creative performance. As previous quantitative studies have shown ambiguous results, the aim with Study III was to obtain a deeper understanding of the underlying mechanisms behind the impact of frustration on creative performance by using qualitative interviews. To avoid memory distortion, which can occur when respondents recall previous events, an experimental setting was created in order to produce frustration before working on a creative task. The specific aim of the study was to investigate thoughts and feelings when working on a creative task after problem-solving failure.

Participants

The study was performed at Karlstad University. Six male and five female respondents were recruited from psychology classes at the university. Respondents were between 20 to 28 years old, and all respondents spoke Swedish fluently.

Instruments

- i. *Necklace Problem (NP)*. The test is a problem-solving test (Silveira, 1971; as cited in J. R. Anderson, 2000), where participants are asked to construct a necklace using four ring chains with three links on each chain. For this study, it cost 4 SEK (Swedish kronor) to open a link, and 5 SEK to close it. In order to solve the problem, the problem-solver has to construct the necklace for 27 SEK. The test was adapted in order to make the problem unsolvable (see Norlander, Nordmarker & Archer, 1998), and participants were instructed to construct the necklace for 26 SEK instead of 27 SEK.
- ii. *Dramatic Events Test (DET)*. The test (Guilford, 1967; Norlander, Bergman & Archer, 1998) measured divergent thinking. The test consists of six fictitious situations, where participants were instructed to record all consequences that would happen if the situation occurred. Three situations were used in the present study, and participants had a time limit of two minutes on each situation. A fluency score was obtained by summarizing all the responses. Respondents were also asked to rate their responses with regard to contentment of responses on an 11-point scale (0 = *not content at all* and 10 = *very content*).

Procedure

Firstly, respondents worked on the NP for 10 minutes. Next, respondents worked on the three DET situations for six minutes. After that, respondents were interviewed on their experiences of the testing. Interviews were semi-structured, and four main questions were used:

How do you feel now?; What do you think of your responses on the DET?; How did it feel to work on the DET?; and What are your thoughts of the NP? In addition, respondents were asked to evaluate contentment of responses on the DET. The interviews were audio-recorded. The interviews lasted between 16 and 33 minutes, where most interviews lasted about 25 minutes.

Analysis

The interviews were transcribed verbatim and analyzed with interpretative phenomenological analysis (IPA), following the procedure described by J. A. Smith and Osborn (2003).

An inductive approach was adopted, where all themes were developed from respondents' statements during the interviews. Interviews were analyzed within an interpretative framework, where the aim was to identify the underlying meaning of respondents' statements.

Correlational analysis (Spearman's rank correlation coefficient) was applied on fluency score and graded contentment on the DET.

Results

The qualitative analysis resulted in two main themes: *Conceptions about the situation* and *Conceptions about communicating responses*.

The theme *Conceptions about the situation* described respondents' feelings and reactions during the testing. Respondents interpreted the testing situation in different ways. It was common for respondents who gave low to medium contentment scores to experience stress with situational demands during the testing, while it was more common for respondents who gave medium to high contentment scores to adapt to the situational demands or take them as a challenge, which gave them motivation to perform well. Some participants also used the failure on the NP as a motivation to perform better on the next test. Further, respondents generally did not think of the failure on the NP during the time they worked on the DET, but started to do so again after the testing session. Respondents generally expressed negative feelings immediately

after testing, unless they had a strong suspicion that the NP was unsolvable. However, even if respondents were discontent with the general performance after the testing session, they could still be content with the performance on the DET. Thus, negative feelings after the testing session were not a good predictor of who was impaired on the divergent-thinking test, less inclined to communicate ideas, or less content with the responses.

The theme *Conceptions about communicating responses* described respondents' thoughts on sharing or withholding ideas. The theme was divided into two sub-themes: *the answer's relevance to the task* and *confidence in the response*. Respondents who gave low to medium contentment scores were generally concerned about meeting the perceived criteria of the task (that is, producing 'right' or 'realistic' responses on the DET). They were also concerned about their phrasing of the responses, considering how other people would receive the responses. Responses that did not meet the criteria of the task were typically erased. Respondents who gave medium to high contentment scores were generally not concerned by the formulation of their responses and saw ideas as a starting point, often in collaboration with others. They were not afraid of being criticized for their ideas. They generally did not strive for realistic responses, but rather saw a valid response as a response that concerned consequences for the entire society.

In addition, fluency scores ranged from 9 to 31, and contentment score ranged from 4 to 8. Further, there was a positive correlation between fluency and contentment.

2.5 Study IV: The effect of evaluation apprehension on creative performance at everyday workplaces

General aim

The results of Study III indicated that evaluation apprehension was an important factor with regard to communicating ideas. Therefore, the overall aim of Study IV was to investigate fear of evaluation in rela-

tion to self-assessed creativity and tendency to withhold ideas in a larger sample.

2.5.1 Survey 1

Design

Participants were presented with a short scenario, after which they assessed how they would perform and react. The predictor variable was fear of negative evaluation, and the dependent variables were self-assessed fluency, originality, appropriateness, worry, and self-censorship of ideas.

Participants

A total of 82 participants were recruited from organizations in Sweden through opportunity sampling. The participants worked in the fields of journalism (29 participants), teaching (45 participants), and public service (8 participants), and there were 26 male participants and 56 female participants. All participants had white-collar employment with knowledge-intensive work tasks.

Instruments

Background data

- i. *Demographics.* A simple demographics survey was applied containing questions regarding age, education and occupation.

Predictor variable

- i. *Brief fear of negative evaluation (BFNE).* The scale (Leary, 1983) measures fear of being evaluated by others. The scale consists of 12 items concerning fearful reactions in social situations. Participants were asked to respond on a five-point scale (1 = *not at all*, and 5 = *extremely*), where a high score signifies high fear of evaluation.

Dependent variables

- i. *Self-assessed fluency*. Three items were constructed to measure the probability to think of a certain number of ideas (1, 5 and 10 ideas) on a 101-point scale (0 = *will not happen* and 100 = *will absolutely happen*).
- ii. *Self-assessed originality*. Three items were constructed to measure the degree of self-assessed originality (think of an idea no one else has thought of; think of an innovative idea; think of a surprising idea) on a 101-point scale (0 = *will not happen*, and 100 = *will absolutely happen*).
- iii. *Self-assessed appropriateness*. One item was constructed to measure the degree of self-assessed appropriateness (think of an idea that is practicable) on a 101-point scale (0 = *will not happen*, and 100 = *will absolutely happen*).
- iv. *Worry*. Three items were constructed to measure the degree of worry (worry about what others think of the idea; worry about what others think of you; excuse oneself before sharing ideas) on a 101-point scale (0 = *will not happen*, and 100 = *will absolutely happen*).
- v. *Self-censorship*. Five items were constructed to measure the degree of self-censorship of ideas (only share ideas you think others will like; share an idea that seems “crazy” (reversed scoring); only share ideas that resemble others’ ideas; only share ideas you feel content about; and withhold ideas others will not appreciate) on a 101-point scale (0 = *will not happen*, and 100 = *will absolutely happen*).

Procedure

The questionnaire and the BFNE were applied electronically to the participants at the newspaper and the local municipality, and in paper form to the teachers. The following scenario was presented to the participants:

Imagine yourself working as a journalist at a newspaper. Currently there is a news drought, and not much to report. You and some of your colleagues are sitting bandying ideas on possible reports with each other.

After reading the scenario, participants responded to the items regarding self-assessed fluency, originality, appropriateness, worry and self-censorship of ideas. Finally, respondents responded to the BFNE and general background data. The survey took about 10 minutes to complete.

Statistics

Correlation analyses (Pearson's r) were applied to the independent variable and the dependent variables. There was no correlation between BFNE and self-assessed originality, and no correlation between BFNE and self-assessed appropriateness. Therefore, no regression analyses were performed concerning those variables.

Simple linear regressions were performed to determine how much BFNE accounted for the variance in the following dependent variables: self-assessed fluency, worry, and self-censorship of ideas.

Results

Using simple linear regression with BFNE as the predictor variable and self-assessed fluency as the dependent variable, a significant model emerged. BFNE was negatively related to self-assessed fluency, and the model explained 10.3 percent of the variance.

Using simple linear regression with BFNE as the predictor variable and worry as the dependent variable, a significant model emerged. BFNE was positively related to worry, and the model explained 47.9 percent of the variance.

Using simple linear regression with BFNE as the predictor variable and self-censorship as the dependent variable, a significant model emerged. BFNE was positively related to self-censorship, and the model explained 35.2 percent of the variance.

The results indicate that evaluation apprehension is associated with a lower creative self-efficacy with regard to fluency, but not with regard to originality and appropriateness. Further, evaluation apprehension only explained 10.3 percent of the variance of self-assessed fluency. Moreover, evaluation apprehension explained much of the variance of worry and self-censorship (47.9 and 35.2 percent, respectively);

therefore, it is plausible that evaluation apprehension is related to a lower will to communicate one's ideas.

2.5.2 Survey 2

Design

Participants were presented with a short scenario regarding a teaching situation, after which they were asked to list as many ideas for engaging the students as they could think of. Predictor variables were fear of negative evaluation and support for creativity, and dependent variables were fluency, originality, and effectiveness.

Participants

A total of 99 teachers (41 males, 56 females and two of other gender) were recruited from schools in Sweden through opportunity sampling. Participants represented teaching in nine-year compulsory school (37 participants); secondary school (53 participants); adult education (5 participants); and three participants indicated "other" on the question regarding teaching stage. Further, 22 participants were teaching practical subjects and 77 participants were teaching theoretical subjects.

Instruments

Background data

- i. *Demographics.* A simple demographics survey was applied containing questions regarding age, education and occupation.

Predictor variables

- i. *Brief fear of negative evaluation (BFNE)*. The same items from Survey 1 were used.
- ii. *Support for creativity*. Support for creativity was measured by the subscale Creativity support from the Creative Environment Scale (Mayfield & Mayfield, 2010; Ritter von Kogerer, 2015). The subscale comprises of three items that measure the degree of perceived support for creative achievements in a workplace. Participants responded on a five-point scale, ranging from 1 (strongly disagree) to 5 (strongly agree), where a high score indicated a high support for creativity.

Dependent variables:

- i. *The creative scenario*. The participants read the following scenario:

You are faced with a teaching situation, and you notice that the students seem to be unmotivated. Some seem to sit and think about other things, others look bored, and some look uncomprehending. What do you do to engage the students? List as many suggestions as you can think of.

After that, participants wrote down as many suggestions they could think of. There was no time limit for the creative task. *Fluency* was calculated by counting the number of responses for each participant. *Originality* and *effectiveness* were evaluated by the consensual assessment technique (Amabile, 1982; 1996), where a panel (consisting of three teachers) assessed each response with regard to originality and effectiveness (that is, if the response would be effective in a real classroom), on a scale from 0 to 10. The scores on originality and effectiveness were tallied for each participant. The total scores on originality and effectiveness for a participant were then divided by the fluency score, which yielded mean scores of originality and effectiveness for each participant.

Procedure

The survey was applied electronically. It took approximately 10 minutes to complete the survey.

Statistics

The interjudge reliability was examined by application Cronbach's alpha. Correlation analyses (Pearson's r) were applied to the independent variables and the dependent variables. There was no correlation between BFNE and originality, and no correlation between BFNE and effectiveness. Therefore, BFNE was not included in the regression analyses regarding those variables.

Linear regressions were performed to determine how much BFNE and support for creativity accounted for the variance in the following dependent variables: fluency, originality, and effectiveness.

Results

Using multiple linear regression (using enter method) with BFNE and support for creativity as predictor variables and fluency as the dependent variable, a significant model emerged. Both BFNE and support for creativity were significant predictors. Both BFNE and support for creativity showed positive relations to fluency. The model explained 9.5 percent of the variance.

Using simple linear regression with support for creativity as predictor variable and originality as the dependent variable, a significant model emerged. Support for creativity was positively related to originality. The model explained 12.3 percent of the variance.

Using simple linear regression with support for creativity as the predictor variable and effectiveness as the dependent variable, a significant model emerged. Support for creativity was positively related to effectiveness. The model explained 13.6 percent of the variance.

The results of Survey 2 indicate that fear of evaluation is only related to fluency and is not related to originality or effectiveness. However, the model (which also included support for creativity) only explained

9.5 percent of the variance of fluency. Support for creativity, on the other hand, showed relations to fluency, originality and effectiveness. The models for originality and effectiveness (where only support for creativity was the predictor variable) explained a larger portion of the variance (12.3 and 13.6 percent, respectively). Hence, the results point to the possibility that a supporting climate on a social level is more important for creative performance than the individual's inclination to expect evaluation.

3. Discussion

3.1 Main findings

Study I examined both group work and individual work and the impact of de Bono creativity-enhancing techniques with regard to creative performance. Experiment 1 showed that the groups produced higher scores on fluency, flexibility and originality-quantity than the individuals. There was no difference between individual work and group work regard to originality-quality. The combined results of the individuals provided higher scores on fluency, flexibility, originality-quantity and originality-quality than the groups.

Experiment 2 showed no differences between the conditions with regard to fluency, but both the Random-word condition and the Provocation condition obtained lower fluency scores after the manipulation than before the manipulation.

Experiment 3 showed that group work produced higher scores on fluency and originality than individual work, but there was no difference between individual work and group work with regard to flexibility. In addition, group work produced higher scores on thought change and incubation during the original meeting, thought change and incubation during the diary, and thought change and incubation during the final meeting than individual work. The results indicate a higher degree of preparation and incubation for group work than for individual work at all times of the experiment. Individual work produced a higher degree of assertion during the original meeting and a higher degree of illumination (that is, formation of ideas) during the final meeting. This implies that the individuals advanced into the later stages of the creative process to a greater extent than the groups. Individual work produced a lower degree of fluency and originality than group work. However, the individuals produced a higher mean score on fluency than the groups.

There were no significant differences between the Control condition and the Random word condition with regard to fluency and originality, but the Random word condition produced a lower score of flexibility than the Control condition. However, the thought change during the diary phase was higher for the Random-word condition than for the

Control condition. This could be explained by the random word that the Random word group was instructed to read at home.

Study II investigated the impact of alcohol and emotional enhancement on creative performance. In experiment 1, the Alcohol group showed a lower degree of unexpected events and imagination and a higher degree of realism than both the Control condition and the Placebo condition. There were no differences between the conditions with regard to logical plot. There were no significant differences between the conditions with regard to primary process or secondary as measured by the Swedish RID. In experiment 2, there were no differences between Films or Gender with regard to Aggressiveness, Destructiveness, Sexual content, Originality, or Literary quality. However, a difference existed between the two films with regard to primary process, as measured by the Swedish RID, where the action film produced more primary process content than the neutral film. Emotional enhancement did not show any effect on creative performance in Study II. However, the emotions were not directly related to the participants themselves, and were perhaps not negative enough to evoke the effects shown by previous research. Therefore, an unpublished experiment was conducted, in which participants experienced failure to complete a task. Again, the experiment did not show any effect on creative performance, but it showed an effect on the women's perception of their performance, as women in the Experiment group were less content than the women in the Control group. Therefore, Study III was conducted in order to further investigate how individuals experience creative work after inducement of negative affect.

Study III investigated subjective experiences of creative work after receiving negative feedback on a problem-solving task. Correlational analysis showed a significant correlation between contentment and fluency, but the interviews revealed that the less-content respondents often had withheld responses or had erased responses they feared were not good enough. Respondents also stated that responses had to be 'correct' or 'realistic' in order to be noted down, as the responses otherwise would not fill the criteria of the task. It was common that situational demands, such as the time limits on the tests, evoked stress in the less-content respondents. In addition, less-content respondents often expressed fear of being evaluated by others. Some of the content respondents considered the situational demands as challenging, and the failure

as a motivation to perform better on the next task. The content respondents were generally not afraid to be criticized by others. It was also common that content respondents expressed that there are no 'correct' answers on a test like the DET, and to view ideas as a starting point for development. Further, there seemed to be no connection between the general feeling expressed directly after the testing session and the work on the creative task, as most respondents described that they did not consider the first problem during the second task, and respondents could express a very negative general feeling after the testing session and still be very content with the responses on the creative task.

Study IV investigated evaluation apprehension in relation to self-assessed ideation as well as actual ideation. Survey 1 showed a negative relation between fear of evaluation and self-assessed fluency, but fear of evaluation did not show any relation to self-assessed originality or appropriateness. Further, there was a positive relation between fear of evaluation and amount of worry and self-censorship of ideas. Survey 2 showed a positive relation between fear of evaluation and fluency, but there were no correlations between fear of evaluation and originality or effectiveness. In addition, support for creativity showed positive relations to all measures of creative performance.

3.2 Implications of findings

The results of Study I are in accordance with previous research showing that a group produces more creative results than an average individual (e.g., Ekvall, 1991; Hill, 1982; Restle & Davis, 1962; Taylor et al., 1958), and that interactive groups produce less creative results than nominal groups (Ekvall, 1991; Furnham & Yazdanpanahi, 1995; Taylor et al., 1958). The findings that the combined scores on originality and flexibility of the individuals were higher than the total scores of groups (experiment 1) could be interpreted as support for the view that members of a group are inclined to conform to the group (Ekvall, 1991; Larey & Paulus, 1999), thus indicating the effect of evaluation apprehension. The results of experiment 3 suggest that group work stimulates the early stages preparation and incubation of the creative process, while individual work facilitates the illumination stage. Thus, brainstorming in groups might be favorable during the early stages of creative work, and

individual work might be favorable to reach the illumination stage. One explanation for these differences considers the relationship between thinking style and creative performance, since Noy (1969) asserted that primary process is related to the early stage of creative performance, whereas secondary process is related to later, more reality oriented stages. The presence of others may induce higher arousal (Bond & Titus, 1983; Mullen, Bryant & Driskell, 1997), and thereby affecting primary and secondary process relations (Ewing et al., 1982). A group might also be viewed as a parallel system of its own, as several different activities can take place simultaneously (that is, the activities of the group members). In that way, the group could be comparable to one person using divergent thinking. Another explanation might be that the individual experiences higher demands, as he or she is personally responsible for obtaining a solution. High demands may induce serial processing (Luria & Meiran, 2005), and convergent thinking (A. Cropley, 2006).

As for the random word technique described by de Bono (1994), it did not enhance fluency score in neither experiment 2 nor experiment 3. If the technique had been effective, as claimed by de Bono (1991), the Random word condition should have produced higher scores on fluency and flexibility compared with the Control condition. Therefore de Bono's (1994) claim that the random word technique instantly gives rise to new ideas and different trails of thought must be questioned. Rather, in the present study, it seems that the random word input restricted the participants' trail of thoughts, as the score on flexibility was lower for participants that had used the random word technique. This effect could be explained by a very strong focus on the random word, and an inability to use the word in a broader perspective and to disregard the literal meaning of the word. The participants may have interpreted the random word input as an explicit instruction to use the word in the final solution, thereby censoring responses that did not fulfill perceived criteria. In addition, according to the theory of path-of-least-resistance (Ward, 1995), the retrieval of an exemplar can inhibit the retrieval of other memories. Therefore, it is possible that the explicit nature of a random word will obstruct the formation of new ideas. Further, as the participants were introduced to a new technique they never had used before, they may have experienced high control demands, which could promote serial processing (Luria & Meiran, 2005) and convergent thinking (A. Cropley, 2006). One limitation with the designs of experi-

ment 2 and experiment 3 is the short period of time for the participants to understand how to use the technique, and the Random word condition might have produced more creative results if participants had attended a training program before taking part in the study. However, a training program could also benefit other aspects of creative performance not associated to the random word technique (see Tripp, 1980). In order to obtain a robust design both the Random word group and the Control group should practice working on creative tasks.

Study II investigated the impact of alcohol and emotional enhancement on creative performance. In experiment 1, there were indications that the Alcohol group exhibited results that were less creative than both the Control group and the Placebo group, as the Alcohol group showed a lower degree of unexpected events and imagination than the two other groups. Unexpected events and imagination could be related to novelty, one of the prerequisites of creative output (Runco & Jaeger, 2012). Further, the fact that the Alcohol group displayed a higher degree of realism than the Placebo group could be interpreted as a sign that the Alcohol group was more evaluative. Alcohol has an effect on the regional cerebral blood flow, where low doses of alcohol is related to an increase the blood flow in the prefrontal cortex, and high doses of alcohol is related to a decrease the blood flow in the prefrontal cortex (Sano et al., 1993). The dosage used in Study II was similar to the low dose used by Sano et al. (1993), and this dosage could have induced increase of the blood flow and activity in the prefrontal cortex. Therefore, impulsive thinking might have been suppressed (Martindale, 1999). This could explain why the Alcohol group showed a lower degree of unexpected events and imagination and a higher degree of realism than both the Control condition and the Placebo condition. In addition, there are other studies where low doses of alcohol have been used that have shown that alcohol produced more conventional thinking (e.g., Kastl, 1969).

However, newer research has indicated that frontal lobe damage is negatively related to creativity (de Souza et al., 2010), and that frontal lobe activity can both enhance and impair creative performance depending on the nature of the task (Dietrich & Kanso, 2010). Further, Montgomery et al. (2011) found that even small amounts of alcohol lead to negative effects on cognitive ability, and that there also seems to be an expectancy effect of alcohol which occurs even if one does not ingest

it (Hicks et al., 2011). Thus, the results of Experiment 1 can be interpreted as a confirmation of the view that alcohol by itself does not enhance creative performance, as the Alcohol group exhibited less creative results, as well as a confirmation of the view that expectancy effects are related to creative performance, since the Placebo group showed more creative results than the Alcohol group. The popular belief that creativity can be enhanced by the ingestion of alcohol could be explained by increased risk-taking behavior (e.g., Lane et al., 2004) and an increased tendency to speak (Higgins & Stitzer, 1988). Thus, alcohol could be associated with a decreased impact of evaluation apprehension and self-censorship. This means that individuals may be more willing to communicate ideas while under the influence of alcohol, although such ideas may not be more creative.

Experiment 2 showed that the action film produced higher primary process content, but that it had no effect on secondary process content. The result support the notion that primary and secondary processes are different processes (e.g., Suler, 1980), rather than end points of a continuum. However, there were no differences between the action film and the neutral film with regard to measurements of creative performance (originality and literary quality). This contradicts the view that creativity is related to high levels of primary process (e.g., Noy, 1969) and that enhanced arousal impairs complex tasks (Bond & Titus, 1983; M. W. Eysenck et al., 2007). Further, S. Smith, Arnett and Newman (1992) stated that aggressive behavior displays inhibit executive functioning, but in the present study, it did not affect the creative performance. Instead, the results supported research showing no direct effect of negative affect on creative performance (e.g., Grawitch et al., 2003). It is important to note that the participants themselves did not exhibit the aggressive behavior, and that the action film may not have induced sufficient emotional enhancement for inhibiting creative performance.

Study III showed that the reaction to stress was crucial with respect to the interpretation of the situation. The time limit was an inhibiting factor for several respondents, which is in line with research regarding the importance of sufficient time for a highly creative climate (Ekvall, 1997). Further, several respondents (mainly low to medium contentment) showed unwillingness to take risks. They reported that they wanted to produce 'correct' responses, or responses that would oc-

cur in real life, further stating that it was important to feel confident in a response in order to share it with others, as they feared others' reactions. This was interpreted as signs of evaluation apprehension and low creative self-efficacy. Respondents high in contentment did not express such worries about their responses. This is consistent with research showing that risk-taking promotes a creative climate (Ekvall, 1997), that evaluation apprehension can inhibit creative performance (e.g., Byron, Khazanchi & Nazarian, 2010), and that a person's self-efficacy can affect the creative performance (e.g., Furnham & Bachtiar, 2008). Additionally, the negative feedback of the first task may have caused a more strengthened sense that there are 'correct' answers, as several respondents who did not produce many responses compared the divergent thinking test with taking an exam. Conversely, respondents who produced many responses often stated that there are no right answers on a test like the one being applied. Thus, any cue that there might be a 'correct' answer or solution can be an inhibiting factor with regard to creative performance. The search for a 'correct' answer is associated with convergent thinking (A. Cropley, 2006; Guilford, 1957); it is therefore probable that the nature of the first task may have evoked convergent thinking in respondents. This can be of importance in education, as a high focus on correct answers can suppress the development of creative ability in school (Nickerson, 2010). The results of Study III implied that the effect of risk-taking, evaluation apprehension and self-efficacy on creative performance may be at least in part indirect, as many respondents with low to medium contentment exhibited a high degree of self-censorship, holding back and/or erasing responses. The results are in accordance with the additional stage communication (A. Cropley & Cropley, 2008) of the creative process, as respondents with low to medium contentment seem to have inhibited the communication stage when not writing down all responses even though they had produced responses. Therefore, respondents presented fewer products (in this case responses), and hence would be viewed as less creative during the validation stage described by A. Cropley and Cropley (2008).

Additionally, the results of Study III are in accordance with the assumptions of the attentional-control theory, which states that anxiety can hinder performance by distracting thoughts, but that it does not have to hinder performance if the person makes an extra effort (M. W. Eysenck et al., 2007). In the present study, the content respondents of-

ten put in extra efforts after the failure, stating that they wanted to perform better on the next test. The less-content respondents, on the other hand, often stated that their performance was hindered by distracting thoughts about the time limit and the number of lines to fill on the DET. However, respondents typically did not report recurring thoughts about the failure during the testing; it was only *after* the testing session that they experienced repeated thoughts about the failure. The negative emotions they experienced were also connected to the failure on the NP, which means that even if respondents were generally discontent, they could be very content with their responses on the DET. This implies that measuring the emotion after the testing session does not capture the emotion present during the testing session. Thus, Study III indicated that the negative affect itself might not produce the inhibiting effect on creative performance shown in some previous studies (e.g., Byron & Khazanchi, 2011). Instead, the results seem to point to the possibility that the individual's perceptions of the situation, interpretation of the task, confidence in the response, and apprehension of others' reactions of the performance were crucial for the performance. This conclusion is in line with research showing that sad persons produced as many responses as happy persons when instructed that all responses were acceptable (Gasper, 2004). Further, the results of Study III are consistent with research on creative climate, showing that a sense of challenge and intellectual stimulation can enhance creativity (Hunter, Bedell & Mumford, 2007), as well as the view that intrinsic motivation can enhance creative performance (Amabile, 1996) and the view that creativity is connected to subjective wellbeing (Burt & Atkinson, 2012), as highly content respondents reported that work on the creative task was fun, challenging and stimulated thoughts about the society in which we live.

Study IV investigated evaluation apprehension in relation to self-assessed ideation and actual ideation. Survey 1 showed a negative relation between fear of negative evaluation and self-assessed fluency, supporting research indicating that evaluation apprehension inhibits creative performance (e.g., Amabile, 1996; Byron, Khazanchi & Nazarian, 2010). However, there was no relation between evaluation apprehension and self-assessed originality or self-assessed appropriateness, both of which are necessary components of a creative product (Runco & Jaeger, 2012). Further, evaluation apprehension showed positive relations with worry. As worry can enhance arousal, the view that evaluation ap-

prehension hinders creative performance can be explained by the notion that arousal enhancement can impair complex cognitive processes (e.g., M. W. Eysenck et al., 2007). In addition, evaluation apprehension showed a positive relation to self-censoring of ideas, which supports the notion that fear of evaluation is related to withholding ideas (Parloff & Handlon, 1964; Williams, 2002). In fact, fear of negative evaluation explained 35.2 percent of the variance in the self-censorship variable, which indicates that evaluation apprehension has a large explanatory value with regard to self-censorship of ideas. Thus, Survey 1 showed that one important inhibiting factor on creative performance is self-censorship of ideas.

In Survey 2, fear of evaluation was positively related to fluency, which contradicts earlier research showing a negative effect of evaluation apprehension on creative performance (Byron, Khazanchi & Nazarian, 2010). The positive relation between fear of evaluation and fluency was interpreted as a sign of increased effort, which can be connected to a reaction to anxiety (M. W. Eysenck et al., 2007). Further, some of the more experienced teachers expressed that the scenario did not provide enough information for formulating effective suggestions. This indicates that they were more concerned with producing effective suggestions than with producing numerous suggestions. This was interpreted as a sign of self-efficacy, as the experienced teachers seemed to rely on their own capability to come up with effective solutions in a certain situation. It is interesting to note that the experienced teachers posed the same criticism to the divergent thinking test as that of Zeng, Proctor and Salvendy (2011), namely that the scenario did not provide enough context for judging the effectiveness of responses. Considering that the number of years teaching showed a negative correlation to fear of evaluation, the results support the view that evaluation apprehension can facilitate simple tasks and impair complex tasks (M. W. Eysenck et al., 2007), as it would be more complicated to think of effective responses than to think of many responses. As originality and appropriateness are conditions for creativity (e.g., Runco & Jaeger, 2012), whereas fluency is not, one must question if evaluation apprehension on its own affects the quality of creative performance; fear of evaluation showed no relation to originality or appropriateness in either Survey 1 or Survey 2. However, since fear of evaluation was related to self-censorship of ideas in Survey 1, the results support the view that self-censorship may be an inhibiting

factor that can explain why evaluation apprehension can negatively affect creative performance (e.g., Williams, 2002), as it is likely that individuals will self-censor original ideas in order to conform to a group.

Survey 2 also showed that support for creativity was positively related to fluency, originality and effectiveness. This implies that a supportive creative climate may facilitate creative performance. Thus, the results of Survey 2 are in line with research pointing to the importance of support for creative performance (e.g., T. Y. Kim et al., 2010; Madjar et al., 2002).

There were contradictions regarding the results of Survey 1 and Survey 2. In the fictitious scenario used in Survey 1, evaluation apprehension was related to a lower degree of fluency. However, in Study 2, where participants actually wrote down responses, evaluation apprehension was instead related to higher fluency. The results indicate that high degrees of fear of negative evaluation is related to self-censorship (Study 1), but also that fear of negative evaluation may be related to an enhanced work effort (Study 2). Therefore, it is also possible that evaluation apprehension is associated with the underestimation of one's own creative potential; that is, with lowering one's creative self-efficacy.

In summation, Study IV showed that evaluation apprehension is related to lower self-efficacy with regard to number of ideas, and to a higher production of ideas. Study IV also showed that evaluation apprehension is not related to self-efficacy regarding originality or appropriateness of ideas or to originality and effectiveness of produced ideas. The results indicate that the inhibiting effect of evaluation apprehension on creativity may be a result of self-censorship, and not a result of impairment of creative ability.

3.3 Limitations and future research

It was beyond the scope of this thesis to capture all aspects of creativity. The focus of this thesis has been mainly on divergent thinking tests and verbal ideation. Divergent thinking tests are considered to be related to creative potential (Runco & Acar, 2012), but it is important to remember that results on divergent thinking tests do not equal creativity (e.g., K. H. Kim, 2008). Considering that originality is more closely related to creativity than fluency (Runco & Acar, 2012; Zeng, Proctor &

Salvendy, 2011), conclusions regarding fluency should be drawn with caution. Further, since the studies were performed in experimental settings or in the form of surveys, real-life creativity has not been studied. This could imply problems with ecological validity, as individuals may not behave the same way in a laboratory as they do at home. Further, seeing that creativity is domain-specific (e.g., Sawyer, 2006), one individual could obtain low scores in one field of creativity but score high in another. The scope of this thesis has been verbal idea production, which means that other domains of creative production have been disregarded. Therefore, this thesis can by no means provide a comprehensive view of all aspects of creativity.

Looking at each study individually, they all have potential weaknesses. These weaknesses are discussed in the text below.

Study I regarded differences between group work and individual work as well as differences between specific creativity techniques and control conditions. One limitation was the small sample sizes, especially for experiment 1. It is harder to obtain statistical significance when sample sizes are small, controlling for type I error (erroneously rejecting a null hypothesis). Therefore, with a small sample the effect size has to be greater in order to be able to reject the null hypothesis. Even so, there were significant differences between the groups in all three experiments, and the calculation of *Cohen's d* also showed large effect sizes. Additionally, there were several background tests to ensure that the groups were comparable before manipulation. Further, power was not reported in Study I; therefore, no measurement for the risk of making a type II error (retaining a false null hypothesis) is presented, and analyses have not been corrected for mass significance. The issue of mass significance – especially in experiment 3, where many analyses were performed – should have been addressed, for instance, through a Bonferroni correction. Another possible limitation is that group cohesion was not regarded for experiments 1 and 3. Group cohesion can affect the group climate, and consequently the self-censorship of the group members. One could argue that individuals will encounter groups with low group cohesion, for instance in their working life. Nonetheless, it would have strengthened the quality of the study to measure group cohesion in the groups, whereby the level of group cohesion could have been controlled. In summation, it is problematic to draw general conclusions solely on the basis of the results of Study I. However, the results of

Study I support and contribute to the body of research showing that real groups outperforms individuals, and that nominal groups outperform real groups. Further, Study I investigated the effect of two supposedly creativity-enhancing techniques developed by de Bono. It is important to evaluate these techniques, given their popularity (with many online resources). Even though there are several limitations with Study I, the study can contribute to a body of research regarding the usage of creativity techniques, particularly experiment 2, which consisted of a larger sample and a mixed design.

Study II regarded the effect of alcohol and emotional enhancement on creative performance. Again, sample sizes were small. However, background testing showed that the groups were comparable. Power and effect sizes are described, which makes it possible to estimate the risk of type II error and the practical significance of the results. However, power was calculated post hoc, which is a statistical weakness.

In summation, the small sample sizes and the post hoc calculation of power limits the value of the study and restricts the possibility to draw conclusions based on the results. Still, the results of experiment 1 were consistent with more recent research on the relation between alcohol and creativity, indicating that there might be a placebo effect of alcohol on creative performance (Hicks, Pedersen, Friedman & McCarthy, 2011). Further, the results of experiment 2 could not resolve the ambiguity displayed in research on negative affect and creativity, but the experiment – in combination with the unpublished study – did give rise to the idea for the design of Study III, which revealed possible mechanisms for those ambiguities.

Study III concerned an explanatory study aimed to investigate the effects of negative affect during creative work in an experimental setting. Since the study was qualitative and the sample was small, it was not possible to draw general conclusions. Further, the sample consisted of students, and future research should also investigate workplace creativity in the natural environment. Yet another limitation of Study III was the lack of pre-testing, for instance, for creative personality or motivation. In sum, the results of Study III cannot be generalized to the overall population. However, the study did give rise to insights that were further investigated in Study IV. Further, the results of Study III can help explain the results of Study I, namely that individuals may hold back ideas in order to not seem ‘stupid’, and that very specific instruc-

tions may limit the individual's thinking, as the individual may perceive the demands to fulfill the instructions very literally.

Study IV concerned two survey studies aiming to investigate the relation between evaluation apprehension and creative self-efficacy (Survey I) and creative performance (Survey II). As the two surveys, in part, showed conflicting results – where participants displayed a lower creative self-efficacy regarding fluency (Survey I) and a higher creative performance regarding fluency (Survey II) – a weakness with Survey II was that there were no measurements on how one thought one had performed in relation to others. Further, the inter-judge reliability for originality in Survey II was on the weak side. This implies that the judges were more diverse in their grading of originality than they were for effectiveness. Moreover, Study IV did not take place in an actual social situation, which is a limitation of the study. Therefore, no conclusions can be drawn regarding behavior in real-life situations. Nonetheless, Study IV has contributed by showing relations between evaluation apprehension and creative self-efficacy, worrying and self-censorship, which in turn can be used to understand the effect of evaluative environments on creative performance.

For both Study I and Study II, power and effect size should have been set *a priori* instead of *ad hoc*, and sample sizes should have been based on the desired power and effect size. This was done in Study IV, as minimum sample sizes were calculated beforehand following the guidelines from Green (1991), taking in consideration desired effect size (medium), power (0.80), number of predictors (one and two, respectively) and probability level (0.05). This is a strength in the design of Study IV compared to the designs of Studies I and II, and shows methodological progression within the scope of the thesis.

The social perspective, reflected mainly in Study III and Study IV, has led to insights that could be fruitful for future research on creativity. Much research in the field has been focused on creative ability and the creative output, while the results of Studies III and IV in this thesis indicate that individuals may self-censor in fear of others' opinions. More research should be performed in order to understand the impact of self-censorship, and how it can be lessened. Thus, future studies could investigate if individuals hold back ideas, and how they could be encouraged to share their ideas with others, in more natural environments such as workplaces or schools. Research could be performed by inter-

views and through field experiments, where the creative climate can be manipulated in the natural environment.

3.4 Summary and final conclusions

Study I showed that working in groups can both enhance and inhibit creative production and that group work seems to affect different stages of the creative process in different ways, where early stages are facilitated and later stages are impeded. Fear of evaluation was shown to relate to quantity of ideas in Study III and Study IV, but not to quality of ideas in Study IV. Evaluation apprehension was related to worry and self-censorship in both Study III and Study IV, which implies that the effect of evaluation apprehension on creativity is indirect; that is, it regards the will to communicate the creative product. Thus, the creative performance in both Study III and Study IV was related to self-censorship. Communication of a creative result can be seen as a stage in the creative performance (A. Cropley & Cropley, 2008), and the results of Study III and Study IV can be interpreted as a sign that inhibition of this stage can render less creative productions. Both Study III and Study IV showed that participants withheld responses, and that this was related to confidence (Study III) and evaluation apprehension (Study III and Study IV). Another inhibiting factor shown in Study III and indicated in Study I was the tendency to conform to situational demands such as new information, the wording of the instruction and trying to find the 'correct' answer. This was apparent in Study III, as several respondents felt that they had to conform to what they perceived as demands of the task in order to succeed on it; the same was implied in Study I, as the Random word condition, which included an explicit instruction on how to work on the creative task, produced lower scores on flexibility than the Control condition. Further, the theory path-of-least-resistance (Ward, 1995) states that retrieval of explicit memories will inhibit retrieval of other memories, which could explain the lower degree of flexibility when explicit instructions are used. Emotional enhancement showed no inhibiting effect on its own on creative performance in Study II or Study III, and it seems that the effect of emotional enhancement on creative performance was indirect; the emotion was less important than the perception of the situation as threatening or non-threatening.

In Study II, Alcohol was shown to inhibit the creative performance, opposing the popular belief but in line with more recent research (e.g., Montgomery, Ashmore & Jansari, 2011). This could indicate that the influence of alcohol may affect creative output indirectly in social situations by increasing the willingness to communicate ideas.

In summation, creative performance can be inhibited and limited by explicit instructions, by the intake of alcohol, by a stressful situation, by implication that there are 'correct' answers or solutions, and by low levels of creative self-efficacy and high levels of evaluation apprehension. However, the main conclusion of this thesis is that inhibition may not always be direct; Study III and Study IV showed that individuals will withhold responses if they fear others' reactions and/or do not feel confident about their ideas. Further, Study III showed that individuals will withhold responses that they fear will not fulfill the criteria of the task. Thus, the results of Study III and Study IV are in accordance with the view that communication of creative results can be seen as a part of the creative process (A. Cropley & Cropley, 2008).

The term 'thinking outside the box' connotes that creative thinking means thinking in an unusual way, breaking free from the previous assumptions of the situation. However, the results of the present investigation suggest that the 'sides' of the box also involve concerns about others' opinions of ideas, as the results of Study III and Study IV showed a prevalence of self-censorship. Therefore, it is possible that the creative potential for individuals with a low will to communicate ideas has been underestimated. On a societal level, this could mean that organizations and enterprises have missed out on creative ideas, as the coworkers might not have felt free to communicate their ideas. As an extension, the society might have missed out on economic growth, as Florida (2006) pointed out that economic growth is connected to tolerance and diversity.

To conclude, the research presented in this thesis implies that individuals may think of more ideas than they communicate with others; they will censor ideas if they feel that the ideas will not be accepted (such as if the ideas are considered to be 'wrong'). The limitation in such instances is not only the individual's creative ability, but also social restrictions and norms (the 'sides' of the box, if you will); concerns about others' reactions may hinder individuals from communicating unusual ideas that do not follow a given instruction. Thus, instead of posing the

question “can you think outside the box?”, it would be reasonable to ask “do you dare to think outside of the box?” In other words, “do you dare to communicate your ideas regardless of others’ opinions?”

However, the important question to ask in the long-term is “how can we create a climate where everyone feels free to communicate ideas without experiencing any restrictions of a ‘box’?” Based on the studies described in this thesis, the restrictions of the box seem, in part, to consist of perceptions of the social situation and of one’s ability, which can lead an individual to self-censor creative expressions. Therefore, in order to reduce the effect of the inhibiting factors, one would have to develop a more accepting climate. This would be a climate where extending the directions of the assignment is approved; where there is little emphasis on a ‘correct’ solution to a problem; where risk-taking is supported; where ideas are viewed as starting points and not as results; and where sharing ideas is encouraged. This conclusion is strengthened by the result of Study IV, where support for creativity was positively related to both quantity and quality of ideas. Thus, in order to obtain a climate where creativity is encouraged, it is important to support creative efforts without passing judgment on the final outcome in order to make individuals confident in expressing their creative potential.

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Do you dare to think outside the box?

Creativity is desired in many situations. Areas where creativity is needed include innovation, product development and artistic performance. Further, creative activities are connected with joy and pleasure for the individual. However, many of us are struggling when it comes to creative performance, and it is considered hard to be creative.

The overall aim of this thesis was to investigate inhibition of creative performance. The results of the four papers comprised in the thesis suggest that group work have an effect on the creative process, explicit instructions may narrow down possible solutions for a problem, alcohol may inhibit creative performance and evaluation apprehension is related to self-censorship of ideas. Further, support for creativity showed positive relations with both quantity and quality of ideas.

The main conclusion of the thesis is that individuals may withhold ideas in fear of others' reactions. Therefore, creative performance is not only a question of ability, but also a question of willingness to communicate.

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