THE MOTIVATING POWER OF VISIONS

EXPLORING THE MECHANISMS

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DEDICATION

To my mom and my dad,
who fostered my curiosity about life,
and who taught me to turn adversity into challenge.

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“There are always flowers for those who want to see them.” *Henri Matisse*

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1 ABSTRACT

Visions are idealized mental images of the future. A core component of the new leadership theories, visions are assumed to promote follower motivation. However, the motivational processes and effects triggered by visions have not yet been empirically explored. Our hypothesis was that visions—just like real images—are motivationally effective by arousing implicit motives. To test this assumption, we conducted three experiments. In each study, we administered visions with specific motivational content to arouse the targeted implicit motive and then measured the strength of the resulting implicit motivation by a variety of motivation indicators. In Study 1, we examined all three motive domains by comparing an affiliation, an agency (i.e., power and achievement combined), and a neutral vision (control condition) with respect to their effects on three motivation indicators: changes in motive imagery on the Picture Story Exercise (PSE) and changes in salivary testosterone and progesterone, two indicators of implicit power and affiliation motivation. As predicted, the affiliation vision condition increased affiliation imagery, whereas the agentic vision condition increased agency imagery on the PSE. Moreover, in the communal condition, increases in affiliation imagery were accompanied by increases in progesterone, whereas in the agentic condition, increases in

power imagery were accompanied by increases in testosterone. Study 2 focused on the achievement domain by comparing an achievement vision and a relaxation task with respect to their effects on three motivation indicators: changes in achievement imagery (i.e., hope for success imagery), affective arousal (i.e., tense arousal, energetic arousal, and hedonic tone), and performance (i.e., reaction time and error rate) on a mental concentration task. As predicted, the achievement vision increased hope for success imagery and tense arousal, and reduced reaction times and error rates. Furthermore, the strength of the person's pre-vision hope for success moderated the influence of achievement vision on energetic arousal and reaction time. Study 3 focused on the domains of affiliation and power, thereby contrasting two motive domains that are known to have opposite effects on the following motivation indicators: changes in salivary alpha-amylase, affective arousal, and cooperation behavior in a prisoner's dilemma. As predicted, the affiliation vision promoted hedonic tone, especially in participants high in the need for affiliation, whereas the power vision promoted tense arousal and interacted with pre-vision need for power to increase energetic arousal. Moreover, the power vision increased the alpha-amylase level and exploitative behavior, particularly in participants high in the need for power. In contrast, the affiliation vision increased cooperation behavior, especially in predominantly affiliation-motivated participants. In sum, the present research provides the first empirical evidence that visions are motivationally effective by arousing implicit motives.

2 INTRODUCTION

A vision—the mental image of a desirable future—can jump-start that future by mobilizing people into action toward achieving it (Nanus, 1992).

In organizational contexts, visions of organizational objectives play an important role for boosting employees' motivation and performance (Kirkpatrick & Locke, 1996) as well as organizational outcomes (e.g., Baum, Locke, & Kirkpatrick, 1998; Lowe, Kroeck, & Sivasubramaniam, 1996).

However, there still remains considerable work to be done in understanding the motivational effects of visions (cf. House & Podsakoff, 1994; Ilies, Judge, & Wagner, 2006; Kantrabutra & Avery, 2002; Shamir, House, & Arthur, 1993).

Although psychological research on motivation might contribute to the understanding of this issue, visions to date have received no attention within this field. Accordingly, the purpose of the present research is to contribute to the understanding of the motivational effects of visions by bridging two so far unrelated fields—the new leadership theories and motivational theories.

In the following, we¹ firstly introduce the vision construct and distinguish it from related constructs. Then, we review the organizational literature on visionary leadership as well as the theoretical approaches to explain its motivational effects. This is followed by an overview of the psychological literature on the motivational effects of the imagined future. Then, we introduce a motivational concept that we believe to account for the motivational effects of visions: implicit motives (McClelland, Koestner, & Weinberger, 1989; Weinberger & McClelland, 1990). Finally, we integrate these lines of research to derive the hypotheses of the present research.

2.1 Visions and related constructs

Within leadership research, the vision construct has been defined in different ways, for instance, as an ideal that represents the shared values of the organization (House & Shamir, 1993); an idealized goal to be achieved in the future (Conger, 1999) that involves both definition of goals and strategies for attaining these goals (Yukl, 1998); or as an image of the future (Kouzes & Posner, 1987) that articulates the values, purposes, and identity of the followers (Boal & Bryson, 1988).

¹ Because the present research could not have been carried out without the help of my collaborators and research assistants, I will use the first person plural throughout the manuscript.

However, the vision construct is not yet defined in a generally agreed upon way, and is frequently combined with distinct constructs (e.g., mission, goals, strategy, or values; cf. Levin, 2000). Hence, it can hardly be distinguished from related constructs. Also, these definitions do not clarify the vision's functions, and, more importantly, many of them ignore the aspect that is crucial and eponymous to the vision—its quasi-perceptual representation as a mental image.

We therefore suggest the following definition: Visions are mental images of a desirable yet attainable future that appear regularly in the stream of thought and are developed by and for individuals, groups, or organizations.

This definition allows to distinguish visions from related constructs in the fields of organizational science and psychology. Visions differ from mission and strategy statements (i.e., a set of propositions that guide the policy and behavior of a company; Campbell & Yeung, 1991) because they are quasi-perceptual mental images that do not involve propositions or instructions. They also can be distinguished from an utopia (i.e., a fantasy or dream that practically cannot be realized; Langdridge, 2006), because they are realistically attainable. Regarding psychological constructs, visions resemble daydreams (i.e., spontaneous thoughts pertaining to immediate or longer-term desires and including instrumental activities to attain the desired future; Klinger, 1971, 1987; Langens, 2002; Singer, 1966), and positive fantasies (e.g., positive images of the future that appear in the stream of thought; e.g., Oettingen, 1999; Oettingen & Mayer, 2002). However, visions do not incidentally and spontaneously, but rather regularly and intentionally, appear in

the stream of thought with the aim to promote motivation. Visions differ from expectations (i.e., judgments of a future event's likelihood; Bandura, 1977; Oettingen & Mayer, 2002), which are cognitive judgments that do not necessarily involve mental imagery. Finally, visions differ from personal goals (i.e., cognitive representations of desired future states; Austin & Vancouver, 1996; Brunstein & Maier, 1996), because visions are originally represented as mental images, whereas goals are not necessarily represented as mental images; they can also be verbally represented. However, visions and goals are hierarchically linked, such that the specific goals are derived from the vision, and the attainment of the goals, in turn, contributes to achieving the vision (Ilies et al., 2006; Zaccaro & Banks, 2001).

2.2 Effects of visions in organizational contexts

Visions are a core component of the new leadership theories (i.e., charismatic leadership; e.g., Conger & Kanungo, 1998; House, 1977; Shamir & Howell, 1999; visionary leadership, e.g., Sashkin, 1988; Westley & Mintzberg, 1988; and transformational leadership, e.g., Bass, 1985; Bass & Avolio, 1993; Tichy & Devanna, 1986). Although the new leadership theories differ in notable ways, they share the core assumption that leaders motivate and lead their followers by articulating and implementing an appealing image of the future—a vision (Baum et al. 1998; Strange & Mumford, 2002). In the following, we

refer to leadership with the vision as a core component as *visionary leadership*.

Numerous studies have examined visionary leadership with respect to follower and organizational outcomes. They reported positive relations between visionary leadership and follower or organizational outcomes (for a review, see Bass & Avolio, 1993; Shamir et al., 1993). Two meta-analyses that separately examined the effects of transformational (Lowe et al., 1996) and charismatic leadership (Fuller, Patterson, Hester, & Stringer, 1996) report positive effects of visions on the leader's effectiveness. However, these studies examined leadership as a multidimensional construct and did not isolate the effects of its sub-components (e.g., the articulation of a compelling vision as opposed to other leadership behaviors, such as intellectual stimulation or individual consideration; e.g., Bono & Judge, 2003; Carter, Jones-Farmer, Armenakis, Field, & Svyantek, 2009; Howell & Avolio, 1993). Only a few empirical studies have isolated the particular effects of visions. These studies provided empirical evidence that visions promote venture growth (Baum et al., 1998), rapidity of organizational change (Larwood, Falbe, Kriger, & Miesing, 1995), as well as follower performance and attitudes (Kirkpatrick & Locke, 1996).

However, despite the quantity of research, the uniform notion among leadership researchers is that "there is no motivational explanation to account for the profound effects of [visionary] leaders" (Shamir et al., 1993, p. 578; see also House & Podsakoff, 1994; Ilies et al., 2006).

There have been a few exceptions to the dearth of attention to the motivational processes that underlie visionary leadership. In their self-concept-based theory, Shamir et al. (1993) proposed that charismatic leadership is motivationally effective because it raises follower self-esteem, collective identity, and intrinsic valence of work. However, there is little empirical support for this theory (Bono, 2001; Shamir, Zakay, Beinin, & Popper, 1998). More importantly, the self-concept-based theory does not explicitly consider the articulation of a vision as leadership behavior.

According to the path-goal theory by House and Dessler (1974), follower motivation results from a complex interaction of leadership behavior (e.g., enhancing subordinate's expectancies, instrumentalities, and valences of goal attainment), follower characteristics (i.e., dependence, authoritarianism, ability, and locus of control), and situational attributes (e.g., task characteristics). However, empirical studies yield little support for this theory (Podsakoff, MacKenzie, Ahearne, & Bommer, 1995; Wofford & Liska, 1993), and again, vision articulation is not examined as it is not explicitly considered as leadership behavior.

A theory that explicitly involves vision articulation as crucial leadership behavior is the theory of motivational leadership (Ilies et al., 2006). Ilies and his colleagues propose that the motivational effects of visionary leadership rely on two mechanisms—an affective and a cognitive mechanism. The affective mechanism involves the contagion of followers with the leader's positive emotions. The cognitive mechanism involves the articulation of the

leader's vision and its effects on goal setting. However, this theory has not yet been empirically tested, and, more importantly, it overemphasizes cognitive processes while ignoring the relevance of implicit motivational and emotional processes to account for the motivational effects of visions.

The motivational theory of charismatic leadership (Choi, 2006) also involves vision articulation as leadership behavior. Additionally, it considers that charismatic leadership affects the follower's implicit motives. More specifically, Choi suggests that the three components of charismatic leadership (i.e., envisioning, empathy, and empowerment) arouse the follower's implicit motives: Envisioning (i.e., the articulation of a viable vision) arouses the follower's achievement motivation by challenging their capabilities and prompting them to set specific, challenging goals; empathy (i.e., the understanding of a person's needs and values) arouses the follower's affiliation motivation by enhancing the identification with and the emotional attachment to the leader; empowerment (i.e., the identification and removal of conditions that foster a sense of powerlessness within the followers) arouses the follower's power motivation by enhancing the follower's perceptions of self-efficacy. Again, to date there is no empirical support for this theory.

In sum, these four approaches provide a broad theoretical framework and suggest various motivational mechanisms that potentially account for the motivational effects of visions. However, the following several issues remain to be addressed:

(1) There is a lack of theoretical approaches that are supported by empirical data.

(2) The approaches ignore the vision's unique quality as a mental image providing a quasi-perceptual simulation of a future reality.

(3) They overemphasize what are viewed as explicit motivational mechanisms (e.g., the enhancement of self-concept, self-efficacy, or goal setting; cf. Weinberger & McClelland, 1990), whereas implicit motivational processes, as described below, are largely ignored.

(4) They take no notice of findings from cognitive, social, and motivational psychology on the motivational effects of the imagined future.

In the following, we review the cognitive and social psychological research on the effects of the imagined future on motivation and performance.

2.3 Psychological research on the motivational benefits of the imagined future

The idea that imagining a desired future promotes motivation has guided decades of psychological research. Indeed, a considerable number of psychological studies has illustrated the motivational benefits of positive images of the future. Research on possible selves (Markus & Nurius, 1986), for instance, demonstrates that a positive image of oneself in the future can promote motivation and performance (Oyserman, Bybee, & Terry, 2006; Ruvalo & Markus, 1992). Additionally, the imagination of concrete future

actions and events enhances motivation and hence helps to achieve them (e.g., Sherman, Skov, Hervitz, & Stock, 1981; for a review, see Johnson & Sherman, 1990). Sherman et al. (1981) asked participants to imagine and explain either success or failure on an anagram task and then predict their performance. Participants who imagined success not only expected to perform better but also actually outperformed those who imagined failure. Similarly, Taylor and Pham (1996) found that students who imagined their successful performance on a midterm exam reported higher motivation to study and higher expectations of success than those in the no-imagery control group or those who had imagined the process of exam preparation. However, the latter began studying earlier, studied longer, and received higher grades. Taylor and her colleagues (e.g., Taylor, Pham, Rivkin, & Armor, 1998) speculate that envisioning the outcome increases expectations of success, motivation, and emotional involvement, whereas envisioning the process prompts concrete action plans and problem-solving activities.

Extending this, Oettingen and her colleagues (e.g., Oettingen & Mayer, 2002; Oettingen, Pak, & Schnetter, 2001; Oettingen & Thorpe, 2006) demonstrated that successful goal-attainment requires mental contrasting, that is, contrasting fantasies about the desired future with the present reality that stands in the way of reaching this future. This activates a person's expectations of whether he or she is able to change reality into the desired future, which, in turn, determines the strength of commitment to fantasy realization. Despite focusing on explicit motivational mechanisms (e.g., self-

efficacy expectations, or setting of and commitment to goals), the authors concede that imagining the desired future also elicits non-conscious (i.e., implicit) motivational processes and thereby triggers implicit motivation. Mental contrasting then ensures that the resulting implicit motivation is transferred into binding goals and instrumental actions.

In sum, this research supports the notion that mentally imagining the desired future elicits motivation. However, within this line of research, the mediating role of implicit motives for the effects of mental images of the future on implicit motivation has remained largely uncharted. In the following, we therefore briefly introduce the concept of implicit motives as opposed to explicit motives, followed by a review of research suggesting that imagination indeed taps into the implicit motivation system.

2.4 Implicit and explicit motives

Within their dual-system model of motivation, McClelland and his colleagues (McClelland et al., 1989; Weinberger & McClelland, 1990) propose the existence of conscious (i.e., explicit) and nonconscious (i.e., implicit) motivational systems that operate independently (e.g., Brunstein, 2008; Schultheiss, 2008; Spangler, 1992).

The implicit motivation system is comprised of a limited number of biologically-based motivational need systems. Each of these implicit motives represents a relatively stable capacity to experience specific types of

incentives as rewarding and specific types of disincentives as aversive (Atkinson, 1957; Schultheiss, 2008). Thus, they *orient* the person's attention towards those incentives, *energize* behavior aimed at attaining (or avoiding) them, and *select* stimuli that predict their proximity and behaviors that are instrumental for attaining (or avoiding) them (McClelland, 1987). The needs for power, affiliation, and achievement (often abbreviated as n Power, n Affiliation, n Achievement, respectively) have been most thoroughly studied. Individuals high in n Power enjoy having an impact on others, individuals high in n Affiliation cherish close, friendly contact with others, and individuals high in n Achievement experience pleasure when they master a challenging task. The implicit motivation system operates outside of the person's conscious awareness. The most frequently used measure of implicit motives is the Picture Story Exercise (PSE; McClelland et al., 1989). On the PSE, participants write imaginative stories about pictures showing ambiguous social situations. Stories are later coded for motive imagery to determine the strength of participants' implicit motives.

The explicit motivation system, in contrast, contains individuals' stable, language-based, and consciously accessible beliefs about their needs and motivational orientations, which are measured via questionnaire scales (e.g., the Personality Research Form, PRF; Jackson, 1984) related to power, affiliation, or achievement (= explicit motives). The explicit motivation system also comprises the goals individuals pursue in their daily life, which are represented as verbal codes.

According to Schultheiss' (2001, 2008) information-processing model of implicit and explicit motivation, the implicit motivation system preferentially responds to nonverbal stimuli, such as facial expressions, gestures, and pictorial stimuli (i.e., film scenes or images; e.g., Klinger, 1967; McClelland & Kirshnit, 1988; Schultheiss & Hale, 2007; Schultheiss, Wirth, & Stanton, 2004; Wirth & Schultheiss, 2006) and influences nondeclarative measures of motivation (i.e., behaviors and processes that are not accessible to, or controlled by, a person's self-concept or verbally represented intentions), such as hormone changes, cardiovascular responses, response speed on performance tasks, implicit learning, nonverbal communication, and other forms of automatic, intuitive behavior (e.g., Brunstein & Maier, 2005; McClelland, 1979; Schultheiss & Brunstein, 2002; Schultheiss, Jones, Davis, & Kley, 2008 ; Schultheiss, Wirth, Torges, et al., 2005; Stanton & Schultheiss, 2009). The explicit motivation system, in contrast, responds most readily to verbal incentives (cf. Schultheiss, 2001, 2008), such as demands, requests, or suggestions, and influences declarative measures of motivation (i.e., measures that tap into a person's self-concept or verbally represented goals and intentions) such as people's decisions, judgments, and executive control of behavior (e.g., Brunstein & Maier, 2005). Thus, the implicit motivation system facilitates an intuitive, incentive-driven mode of behavioral regulation and automatically provides necessary energy and intuitive skills (Schultheiss, 2008). The explicit motivation system, in contrast, is in the service of conscious and effortful behavioral regulation. Moreover, a recent study of

Schultheiss et al. (2008) implies that implicit motives, but not explicit motives, predict hedonic feelings which often accompany the attainment of motive-congruent goals. Hence, implicit motivation, as opposed to explicit motivation, is more intrinsically rewarding and sustainable.

In the following, we discuss whether mental images, just like real images, have the capacity to arouse implicit motives.

2.5 Implicit motive arousal through mental images

Evidence for the efficacy of mental images to arouse implicit motives comes from psychological studies on goal imagery. In a series of studies by Schultheiss and Brunstein (1999), participants were given power- or affiliation-related goals and then either mentally imagined the pursuit and attainment of the goal (goal imagery group) or not (control group). The results showed that in the goal imagery group, but not the control group, declarative (e.g., goal commitment, self-reported activation) and non-declarative (e.g., task performance, expressive behavior) measures of motivation were well-aligned with the person's implicit motives. Similarly, Job and Brandstätter (2009) found that in participants who engaged in goal imagery and focused on motive-specific affective incentives, as opposed to participants in a no-imagery control group, implicit motives positively predicted goal-setting. This implies that the translation of goals from its native language-based representational format into the quasi-perceptual format of mental images grants them

access to the implicit motive system (cf. Schultheiss & Brunstein, 1999).

Relevant findings also come from leadership research. A recent study of Naidoo and Lord (2008; for similar findings, see Emrich, Brower, Feldman, & Garland, 2001) yielded evidence for the importance of imagery for visionary leadership. Participants listened to presidential speeches that were rewritten to create low and high imagery versions and then rated the speeches on various leadership measures. High imagery speeches led to increased charisma ratings. This was partially mediated by increases in listeners' positive affect, which is a core characteristic of implicit motivation (cf. Weinberger & McClelland, 1990). This might imply that high as opposed to low imagery in speech prompted mental imagery, which, in turn, aroused participants' implicit motives and thereby elicited positive affect. The stronger affective responses, in turn, might then have enhanced participants' perceptions of charisma.

Why does mental imagery tap into the implicit motivation system? In accordance with Schultheiss and Brunstein (1999), we argue that mental images should be equivalent to real images. Findings of cognitive neuroscience yield support for this notion: Mental imagery involves the same brain areas dedicated to the processing of actual perceptions (Farah, 1985, 1988; Finke, 1989; Kosslyn, 1994; Kosslyn, Alpert, Thompson, et al., 1993). As visions per definitionem are mental images and do not need to be intentionally translated into this format, we assume that visions have the capacity to arouse a person's implicit motives and elicit implicit motivation.

2.6 *Integration and present research*

In the light of the aforementioned findings, it seems promising that a comprehensive approach combining leadership theories with modern accounts of motivation can account for the motivational benefits of visions and the underlying motivational processes. To date, no study has examined how a vision's content interacts with a person's implicit motives on motivational outcomes.

In the present research, we were guided by the hypothesis that visions are motivationally effective by arousing a person's implicit motives. More specifically, we expected that a motive-specific vision (i.e., a vision with a specific [power, achievement, or affiliation] motivational content) arouses the targeted implicit motive and thereby facilitates the recruitment and energization of adaptive behavior as well as physiological states supporting their execution. This effect should be influenced by the individual's implicit motives, such that individuals who have a strong implicit motive, relative those with a low implicit motive, show a greater increase in implicit motivation².

² In the following, we differentiate between *implicit motives* indicating a stable personality disposition (measured via pre-vision PSE; abbreviated as, for instance, n Agency, n Affiliation, n Power, hope for success, or fear of failure) and *implicit motivation* indicating the current state of implicit motive arousal (measured as residualized change scores of motivation indicators; abbreviated as, for instance, agency imagery changes, tense arousal changes, etc.).

To test our hypotheses, we conducted three experiments in which we experimentally varied the vision's motivational content and assessed participants' implicit motives. We then administered visions with specific motivational content to arouse the targeted implicit motive. The strength of the resulting implicit motivation was measured by a range of motivation indicators. More specifically, we used physiological (i.e., changes in salivary testosterone, progesterone, and alpha-amylase levels), behavioral (i.e., changes in performance and cooperation behavior), affective (i.e., self-reported affective arousal), and mental content (i.e., changes in motive imagery on PSE stories) indicators of motivation. Apart from alpha-amylase, which is an enzymatic marker of sympathetic activity (e.g., Chatterton, Vogelsong, Lu, Ellman, Hudgens, 1996; Nater & Rohleder, 2009), we only used classical motivation indicators, which have been successfully used to measure implicit motivation (Atkinson & McClelland, 1948; Brunstein & Maier, 2005; Schultheiss & Brunstein, 1999; Schultheiss et al., 2004; Terhune, 1968; Wirth & Schultheiss, 2006).

Moreover, we selected motivation indicators that cover the three hallmarks of implicit motivation: orientation of attention towards motive-relevant cues, energization of behavior, and selection of behavior (McClelland, 1987). The orientation of attention towards motive-relevant cues is represented by increases in motive imagery on PSE stories (see Study 1 and 2), because increasing motive imagery indicates an enhanced sensitivity for motive-specific stimuli inherent to the PSE picture. The energization of

behavior is represented by increases in performance on a mental concentration task (see Study 2), in self-reported tense arousal or energetic arousal (see Study 2 and 3), as well as in salivary alpha-amylase (see Study 3). The selection of behavior is represented by the choice of cooperative vs. exploitive behavior in a prisoner's dilemma (Study 3). With salivary progesterone and testosterone, we additionally assessed indicators of physiological states supporting the execution of instrumental behavior.

In the following, we present methods and results of the three studies. In Study 1, we examined all three motive domains by comparing an affiliation, an agency (n Power and n Achievement combined; Brunstein, Schultheiss & Grässmann, 1998; Woike, McLeod, & Goggin, 2003), and a neutral vision with respect to their effects on three motivation indicators: motive imagery on the PSE, as well as changes in salivary testosterone and progesterone. In Study 2 and 3, we then further explored the specific effects of visions on each implicit motive: In Study 2, we examined the effects of an achievement vision on motive imagery, performance, and affective arousal, while in Study 3, we focused on the affiliation and power domains, thereby contrasting two motive domains that are known to have opposite effects on motivation indicators (McClelland, 1989) such as changes in salivary alpha-amylase, self-reported affective arousal, or cooperation behavior in a prisoner's dilemma.

3 STUDY 1—EFFECTS OF AFFILIATION AND AGENCY VISIONS ON CHANGES IN MOTIVE IMAGERY, TESTOSTERONE, AND PROGESTERONE

In Study 1, we intended to incorporate all three motive domains and contrast them against a neutral control condition. We compared an affiliation, an agency, and a neutral vision in terms of their motivational effects on three motivation indicators: residualized changes in motive imagery on the PSE, as well as changes in salivary testosterone and progesterone.

Changes in motive imagery. Traditionally, increases in motive imagery on PSE stories have been used as an indicator of the experimental arousal of implicit motives (e.g., via deprivation from need satisfaction, Atkinson & McClelland, 1948; or motive thematic film segments, McClelland & Kirshnit, 1988; Schultheiss et al., 2004; Wirth & Schultheiss, 2006). Hence, we hypothesized that the affiliation vision, compared to the agency and the neutral vision, would lead to an increase in affiliation imagery, whereas the agency vision, compared to the other two vision conditions, would lead to an increase in agency imagery. Moreover, we expected that these effects would be moderated by the individual's implicit motives, such that in the affiliation vision condition, participants high in n Affiliation, as opposed to those low in n

Affiliation, would show a stronger increase in affiliation imagery. Similarly, in the agency vision condition, individual's high in n Agency, as opposed to those low in n Agency, should show a greater increase in agency imagery.

Changes in salivary hormone levels. To support the proposition that increases in motive imagery indicate the arousal of the targeted implicit motive, we additionally assessed changes in salivary hormone levels that are associated with the arousal of n Power or n Affiliation. Prior research has shown that the arousal of n Power (e.g., via winning a competition or watching power-thematic film segments) is associated with increasing salivary testosterone levels, whereas the arousal of n Affiliation (e.g., via film affiliation-thematic segments or via social closeness) is associated with increasing salivary progesterone levels (Brown, Fredrickson, Wirth, et al., 2009; Schultheiss et al., 2004; Wirth & Schultheiss, 2006). Therefore, we hypothesized that in the affiliation vision condition, changes in affiliation imagery would be associated with changes in salivary progesterone, while in the agency vision condition, changes in power³ imagery would be associated with changes in salivary testosterone.

³ We use n Power instead of n Agency to predict increases in testosterone since testosterone has been found to be associated with n Power but not with n Achievement.

3.1 Method

Participants. Seventy-two students enrolled at the Technical University of Munich or the Ludwig-Maximilian University of Munich participated for payment of €20 in the study. Participants signed up in response to fliers posted on campus. Study 1 and 3, because they involved salivary analyses, had received prior approval by the ethics committee of the Technical University of Munich, and participants of all three studies provided informed consent. Of the initial pool of participants, seven were dropped from the analyses because they were either extreme outliers in age ($n = 1$, 61 years), were not German native speakers ($n = 1^4$), or because they dropped out of the study or refused certain parts of the experiment ($n = 5$). The final data set used for the analyses was based on 65 participants (35 women, 30 men) with a mean age of 24.1 years ($SD = 3.91$).

Design. We used an Aptitude Treatment Interaction (ATI) design to test for the effects of the visions and participants' implicit motives on implicit motivation. The treatment factor *vision condition* determined whether participants were administered an agency, affiliation, or neutral vision. Participants were randomly assigned to the three conditions (affiliation vision condition, $n = 20$; agency vision condition, $n = 21$; neutral vision condition, $n =$

⁴ We dropped participants who were not German native speakers because the understanding of the vision could not be ensured.

24). The two aptitude factors were participants' pre-vision scores on *n Agency* and *n Affiliation*, which were entered as continuous variables in subsequent statistical analyses. Dependant variables were residualized changes in power and affiliation motive imagery as well as in salivary testosterone and progesterone.

Procedure. Each participant attended a session lasting about 90 minutes. First, participants provided a saliva sample and then completed the pre-vision PSE for the assessment of *n Affiliation*, *n Power*, and *n Achievement*. This was followed by the guided visualization of either the affiliation, agency, or neutral vision (see below). Then, the post-vision measurements were administered: Participants completed the post-vision PSE containing pictures that matched the pre-vision set in incentive value, and then provided a second saliva sample to assess post-vision salivary testosterone and progesterone levels. Finally, participants provided demographic information and were queried about gum bleeding, smoking, menstrual cycle, and hormonal contraceptive status. They were then thanked and debriefed. The PSE and all questionnaires of all studies were programmed in Inquisit 2.0 (Millisecond Software, Seattle, WA).

Vision administration. In order to evoke a mental image in the participants' mind that is standardized, the visions were administered using the guided visualization technique, which has been adapted from Schultheiss and Brunstein (1999). Furthermore, the vision should (a) contain incentives

for the relevant motive domain⁵ and (b) have a certain personal significance for all participants. We therefore chose a scenario that is relevant for all students—the graduation ceremony—and framed it either in an agency- or an affiliation-thematic way.

Participants were asked to lie down on a couch and listen via headphones to a 10-minute long prerecorded script featuring a male speaker (the visions scripts of all three studies can be found in Appendix A). In all three conditions, the vision scripts started with a short relaxation exercise (4 min) during which participants were instructed to close their eyes and keep them closed until the end of the guided imagery. This was followed by the guided visualization which varied across conditions. In the agency vision condition, the speaker vividly described the graduation ceremony cast in an agency-related frame (i.e., achieving excellent performance, being on the stage and recognized by the audience). In the affiliation vision condition, the same situation was presented in an affiliation-related frame (i.e., being together with close friends and family or remembering pleasant experiences with other students). In the control condition, participants were guided to visualize a triangle (i.e., how it turns around or changes size and color, etc.) having no incentive value for any motive.

⁵ According to Kirkpatrick, Wofford, and Baum (2002), visions can be classified with respect to their motivational content. Based on the Winter's (1994) PSE content coding system, we formulated monothematic visions, that is, visions that contain motive imagery for one specific motive.

Implicit motives and post-vision motive imagery. N Agency and n Affiliation were assessed with the pre-vision PSE consisting of Pang and Schultheiss' (2005) 6-picture set. Post-vision agency and affiliation imagery were assessed with the post-vision PSE consisting of the following four pictures: *architect at desk* (Smith, 1992), *the gymnast* (Hay/McBer Company), *men on ship deck* (McClelland, 1975), and *night club scene* (McClelland, 1975). Participants followed the standard instructions for computer administration described by Schultheiss and Pang (2007). Picture order was randomized for each participant. Each picture was shown for 10 s and then replaced by a screen with writing instructions. Participants were instructed to type their stories directly into a window on the screen with the guiding questions appearing above the writing window. After 4 min had elapsed, a text appeared in the lower half of the screen instructing participants to finish the story and move on to the next picture. Protocol length of typed stories was determined through a utility programmed in Matlab 7.0 (MathWorks, Natick, MA).

PSE stories were blind-coded for achievement, affiliation, and power motive imagery by a trained scorer using Winter's (1994) *Manual for Scoring Motive Imagery in Running Text*. According to the manual, power imagery is scored whenever a story character shows a concern with having impact on others through strong, forceful actions, controlling, influencing, helping, impressing, or eliciting strong emotions in others. Achievement imagery is scored whenever a character shows a concern with a standard of excellence,

as indicated by positive evaluations of goals and performances, winning or competing with others, disappointment about failure, or unique accomplishments. Affiliation imagery is scored whenever a story character shows a concern with establishing, maintaining, or restoring friendly relations, as expressed by positive feelings towards others, sadness about separation, affiliative activities, or friendly, nurturing acts. The coder had previously exceeded 85% inter-scorer agreement on calibration materials pre-scored by an expert. To additionally ensure a sufficient inter-rater reliability, 25% of the PSE stories were content-coded by a second independent coder. Both coders achieved a percentage category agreement of 86% for *n* Achievement, 96% for *n* Affiliation, and 87% for *n* Power (category agreement = $[2 \times \text{no. of agreement between scorers on motive imagery}] / [\text{no. of times scorer 1 scored motive imagery} + \text{no. of times scorer 2 scored motive imagery}]$). Scores were assigned to typed PSE stories by entering them directly into the text documents and were then extracted by a utility programmed in Matlab (Version 7.0; 2007; MathWorks, Natick, MA) that automatically wrote each participant's motive scores into a data file.

In order to bring the motive scores into closer alignment with a normal distribution and thereby avoid outlier problems in our analyses, we conducted a square-root transformation with all pre- and post-vision motive scores and word-counts, except for the post-vision score of power imagery and the post-vision word count. PSE protocol lengths were significantly correlated with participants' overall motive scores: Pre-vision protocol length ($M = 526.25$, SD

= 143.42) correlated with pre-vision n Power ($M = 3.85$, $SD = 2.17$), $r = .60$, n Achievement ($M = 4.07$, $SD = 2.15$), $r = .49$, and n Affiliation ($M = 5.74$, $SD = 1.98$), $r = .42$, all $ps < .001$; post-vision protocol length ($M = 348.58$, $SD = 103.37$) correlated with post-vision power imagery ($M = 2.25$, $SD = 1.56$), $r = .43$, achievement imagery ($M = 3.04$, $SD = 1.61$), $r = .30$, and affiliation imagery ($M = 4.75$, $SD = 1.67$), $r = .37$, all $ps < .05$. Therefore, we corrected for the influence of protocol length by regression. Finally, following the recommendations of Cohen, Cohen, Aiken, and West (2003), we converted the residuals to z scores.

Following the recommendations of Brunstein et al. (1998), z scores for n Achievement and n Power were averaged to obtain a measure of n Agency (pre-vision $M = 0.00$, $SD = 0.79$; post-vision $M = 0.00$, $SD = 0.64$). The data structure supports the integration of n Achievement and n Power to n Agency: Pre-vision n Achievement and n Power are significantly and positively correlated, $r = .25$, $p = .049$, and both were negatively, yet non-significantly, correlated with n Affiliation, $rs (ps) = -.08 (.51)$, $-.07 (.60)$, respectively. Also, regression analysis of condition and separate pre-vision n Power and n Achievement scores on post-vision power and achievement imagery revealed similar effects for pre-vision n Power and n Achievement.

Salivary progesterone and testosterone. Pre-vision saliva samples were taken at the beginning of each session. Post-vision salivary samples were collected approximately 15 min after the vision had been administered. All samples were taken between 12 p.m. and 6 p.m. to control for circadian

declines in hormone levels. For both pre- and post-vision sampling, saliva was collected by having participants passively drool at least 2.5 mL of saliva into polypropylene tubes. All saliva samples were closed and frozen immediately after collection. The assay analyses were conducted by the Kirschbaum Hormone Laboratory at the Technical University of Dresden, Germany, using commercially available luminescence immuno-assays for salivary testosterone and progesterone (IBL, Hamburg, Germany). The intra-assay coefficient of variation (CV) of the used assays was below 10%. Analytical sensitivity (B0 - 2 SD) was at 1.8 pg/mL for testosterone and at 2.6 pg/mL for progesterone assays. Participants' means were 57.21 ($SD = 53.73$) for pre-vision progesterone and 70.36 ($SD = 120.58$) for post-vision progesterone. Progesterone data were skewed and thus log-transformed prior to all statistical analyses. For the testosterone analyses, two participants were dropped due to assay errors ($n = 2$). The data set was then based on 63 participants (35 women, 28 men). Participants' means were 69.77 ($SD = 52.53$) for pre-vision testosterone scores, and 69.54 ($SD = 56.90$) for post-vision testosterone scores.

Statistical analyses. The following analytic procedures and strategies were used in all three studies. Analyses were conducted with SYSTAT 12 and involved mainly the General Linear Model (GLM) comprising ANCOVA and regression analysis to accommodate all quantitative and qualitative variables and their interactions. Furthermore, bivariate correlations and *t*-tests were involved. An alpha level of 0.05 (two-tailed) was employed in all analyses. As

in all three studies pre-vision scores positively and significantly correlated with post-vision scores (see Tables 1, 2, and 3), we examined effects of vision on post-vision variables while controlling for possible interindividual differences at baseline (pre-vision). Significant results obtained from these analyses can thus be interpreted as significant effects accounting for residual changes from the pre-vision to the post-vision assessment.

3.2 Results

Preliminary analyses. Table 1 displays the intercorrelations of all variables of Study 1. Participants' pre-vision scores (i.e., n Affiliation, n Power, n Achievement, pre-vision testosterone and progesterone) did not significantly differ across the three experimental conditions ($ps > .16$). Also, participants' gender and age had no impact on the results reported below. Pre-vision levels of progesterone⁶ ($M = 3.81$, $SD = 0.68$) did not differ between men ($M = 3.75$, $SD = 0.65$) and women ($M = 3.86$, $SD = 0.70$), whereas pre-vision levels of testosterone differed significantly between men ($M = 102.65$, $SD = 36.04$) and women ($M = 14.59$, $SD = 14.58$), $t(63) = 9.77$, $p < .0001$. However, this is negligible as all analyses are based on an ANCOVA design controlling for interindividual differences at baseline (pre-vision).

⁶ The means and standard derivations displayed here are for the log-transformed progesterone scores.

Table 1

Correlations for pre-vision implicit motives, post-vision motive imagery, pre-vision hormone levels, and post-vision hormone levels in Study 1.

	1	2	3	4	5	6	7	8	9	10	11	12
<i>Pre-vision implicit motive scores</i>												
1. n Power	--											
2. n Achievement	.25*	--										
3. n Affiliation	-.07	-.08	--									
4. n Agency	.79***	.79***	-.09	--								
<i>Post-vision motive imagery scores</i>												
5. Power.14	.20	-.12	.21	--								
6. Achievement.12	.15	.19	.17	-.18	--							
7. Affiliation.01	.01	.32**	.02	-.18	-.06	--						
8. Agency.20	.27*	.05	.30*	.64***	.64***	-.19	--					
<i>Pre-vision hormone levels</i>												
9. Salivary testosterone	.06	-.03	-.20	-.02	-.02	-.24	-.29*	-.20	--			
10. Salivary progesterone	.06	.06	.01	.08	.07	-.05	.02	.02	-.04	--		
<i>Post-vision hormone levels</i>												
11. Salivary testosterone	.12	-.01	-.21	.07	.03	-.28*	-.26*	-.19	.94***	-.01	--	
12. Salivary progesterone	-.03	-.08	.19	-.06	-.15	.01	.44	-.11	-.25	.31*	-.22	--

Note. * $p < .05$; ** $p < .01$; *** $p < .005$. Progesterone scores are log-transformed.

Motive imagery. To test whether the vision's motivational content indeed increased imagery of the targeted motive, we conducted an ANCOVA on post-vision agency imagery with vision condition as the factor and pre-vision n Agency as a covariate. This analysis revealed a significant main effect of vision condition on post-vision agency imagery, $F(2, 61) = 3.43, p = .039$. As depicted in Figure 1 and confirmed by post-hoc tests, participants in the agency vision condition had a significantly greater increase in agency imagery than those in the affiliation vision condition, $F(1, 42) = 5.04, p = .030$, or neutral vision condition, $F(1, 38) = 5.12, p = .029$. The neutral and affiliation vision conditions did not differ from each other, $F(1, 41) = 0.09, p = .772$. However, the increase of post-vision agency imagery was not moderated by pre-vision n Agency, $F(1, 59) = 0.81, p = .45$.

Parallel effects were found for the affiliation domain: The ANCOVA on post-vision affiliation imagery with vision condition as the factor and pre-vision n Affiliation as a covariate revealed a significant main effect of vision condition on post-vision affiliation imagery, $F(2, 61) = 4.60, p = .026$. As displayed in Figure 1 and confirmed by post-hoc tests, participants' pre-to-post-vision increase in affiliation imagery was significantly greater in the affiliation vision condition than in the agency vision condition, $F(1, 38) = 10.57, p = .002$, and marginally higher than in the neutral vision condition, $F(1, 41) = 3.33, p = .075$. The neutral and agency vision conditions did not differ from each other, $F(1, 42) = 2.13, p = .15$. Again, the increase of post-vision affiliation imagery was not moderated by pre-vision n Affiliation, $F(1, 59) = 1.82, p = .17$.

Figure 1. Effects of vision condition on residualized change scores in affiliation and agency imagery (z scores). Error bars represent the standard error of the mean.

Testosterone and progesterone. To support the notion that the reported changes in motive imagery indeed indicate implicit motive arousal, we additionally analyzed whether changes in motive imagery were accompanied by changes in salivary testosterone or progesterone, two hormonal markers of implicit motive arousal (Schultheiss et al., 2004; Schultheiss, 2007). More precisely, we tested whether in the agency vision condition, changes in power imagery were associated with changes in salivary testosterone, and in the affiliation vision condition, changes in affiliation imagery were associated with changes in salivary progesterone.

We analyzed both progesterone and testosterone using the following ANCOVA approach: We conducted an ANCOVA on post-vision hormone levels with vision condition as the categorical between-subjects factor, changes in motive imagery as the quantitative between-subjects factor, and pre-vision hormone level as a covariate.

Testosterone analyses yielded no significant main or interaction effects. However, although the interaction effect of Vision Condition x Changes in Power Imagery on testosterone changes failed to reach significance ($F(2, 56) = 2.25, p = .126$), it was in the predicted direction. Therefore, we dropped participants who self-identified as a smoker ($n = 19$), were taking oral contraceptives ($n = 17$), or had bleeding gums ($n = 2$) as these factors are known to impede the validity of testosterone assays (Schultheiss & Stanton, 2009). The final data set was based on 33 participants (13 women, 20 men) with a mean age of 23.45 years ($SD = 7.8$). The analysis revealed a marginally significant interaction effect of Vision Condition x Changes in Power Imagery, $F(2, 26) = 2.79, p = .08$, on testosterone changes, which accounted for a variance increment of 0.1594% in post-vision testosterone. As can be seen in Figure 2 and was confirmed by post-hoc tests, in the agency vision condition, changes in power motive imagery predicted changes in testosterone, $B = 15.59, SE = 7.42, t(9) = 2.10, p = .065$. As predicted, this relationship was not present in the neutral vision condition, $B = 1.59, SE = 7.06, t(9) = 0.14, p = .89$, and was even negative in the affiliation vision condition, $B = -17.11, SE = 7.71, t(6) = -2.11, p = .068$.

The regression slope in the agency vision condition was positive and differed significantly from the negative slope in the affiliation vision condition, $F(1, 16) = 5.60$, $p = .03$, but not significantly from the flat slope in the neutral vision condition, $F(1, 19) = 2.09$, $p = .16$. The regression slopes in the neutral and affiliation vision conditions did not differ from each other, $F(1, 16) = 2.0$, $p = .17$. Hence, it was in the agency vision condition alone that increases in power imagery predicted testosterone increases.

Figure 2. Residualized changes in salivary testosterone (z scores) as a function of residualized changes in power motive imagery (z scores) and vision condition. Thirty-two participants were excluded from the analysis due to assay errors, use of oral contraceptives, gum bleeding, or smoking. Solid line/filled dots: agency vision condition; striped line/open dots: affiliation vision condition; crosses/dotted line: neutral vision condition.

The analysis for progesterone using the whole sample showed a significant main effect of changes in affiliation imagery, $F(1, 27) = 6.56, p = .016$, which was qualified by a significant interaction effect of Vision Condition x Affiliation Imagery Changes, $F(2, 27) = 9.59, p = .0007$ (see Figure 3). This significant interaction accounted for a variance increment of 26.78% in post-vision progesterone. Investigating this interaction further, we found that in the affiliation vision condition, changes in affiliation motive imagery positively predicted changes in progesterone, $B = 0.95, SE = .17, t(17) = 5.58, p < .0001$. As predicted, this relationship was not present in the neutral vision condition, $B = -0.009, SE = 0.10, t(21) = -0.09, p = .93$, or in the agency vision condition, $B = -0.09, SE = 0.11, t(18) = -0.81, p = .43$. As depicted in Figure 3 and confirmed by post-hoc tests, the positive regression slope in the affiliation vision condition differed significantly from the flat slope in the agency vision condition, $F(1, 36) = 27.50, p < .00001$, and the neutral vision condition, $F(1, 39) = 23.99, p < .00005$. Agency and neutral vision condition regression slopes did not differ from each other, $F(1, 40) = 0.32, p = .58$. Hence, it was in the affiliation vision condition only that increases in affiliation imagery predicted progesterone increases. As in the testosterone analyses, we ran further analyses excluding participants that were smoking, using oral contraceptives, or had bleeding gums. The final data set for the progesterone analyses was based on 34 participants (13 women, 21 men) with a mean age of 23.61 years ($SD = 2.84$). The analysis with the reduced data set still showed a significant main effect of changes in affiliation imagery, $F(1, 27) =$

6.56, $p = .016$, which was again qualified by a significant interaction effect of Vision Condition x Changes in Affiliation Imagery, $F(2, 27) = 9.59$, $p = 0.0007$. This interaction accounted for a variance increment of 23.75% in post-vision progesterone. Hence, in the affiliation vision condition, the association between increases in affiliation motive imagery and increases in progesterone is robust and not influenced by any confounding variables.

Figure 3. Residualized changes in salivary progesterone (z scores) as a function of residualized changes in affiliation motive imagery (z scores) and vision condition. Solid line/filled dots: agency vision condition; striped line/open dots: affiliation vision condition; crosses/dotted line: neutral vision condition.

3.3 Discussion

These results provide initial support for the notion that visions have the capacity to arouse implicit motives for all three motive domains. The increase in motive imagery elicited by the visions suggests that the motivational content of visions enhances the person's sensitivity for motive-relevant cues inherent to the PSE picture, and therefore also increases motivational fantasies expressed in PSE stories. This reflects the first function of aroused implicit motives: orientation of attention towards motive-relevant cues (Schultheiss & Hale, 2007). The accompanying changes in testosterone and progesterone—hormonal correlates of dominance behavior and social closeness behavior respectively—provide physiological evidence that the changes in motive imagery indeed reflect implicit motive arousal.

However, our results do not support our hypothesis that the vision's effect on motive imagery is moderated by the individual's implicit motives (i.e., the pre-vision motive imagery). We speculate that this is due to the following factors: We measured the person's implicit motive disposition and the current motivation using the same measure, namely the PSE. The PSE-scoring rules (Winter, 1994) restrict scorers to scoring imagery of a particular motive only once per sentence unless it is separated by imagery of another motive. Therefore, the amount of motive imagery that can be scored is limited by the length of the PSE story. This may have caused a ceiling effect in that it kept

participants high in pre-vision motive imagery from showing further increases in scorable motive imagery. Participants low in pre-vision motive imagery would also show only moderate increases as they have a low implicit motive. These two processes may have contributed to a failure to observe stronger motive imagery increases in participants with a strong implicit motive as opposed to those with a weak implicit motive. Further limitations of Study 1 are that the generalizability of the testosterone findings is limited as we have excluded 32 participants from the analysis. Moreover, as *n* Achievement and *n* Power have been combined to form *n* Agency, the separate effects for the achievement and power domain remain untested. Finally, the functions of energization and selection of behavior have not yet been tested.

Consequently, the following studies are necessary to (1) examine the moderating effects of the person's implicit motives by including motivation indicators that do not give rise to ceiling effects, (2) examine the three motive domains separately, and (3) confirm that the motivational effects of visions apart from orientation of attention also involve the functions of energization and selection of instrumental behavior.

4 STUDY 2—EFFECTS OF AN ACHIEVEMENT VISION ON MOTIVE IMAGERY, AFFECTIVE AROUSAL, AND PERFORMAMCE ON A MENTAL CONCENTRATION TASK

After showing the motivational effects of visions for the agency and affiliation domain and contrasting them against a control condition (neutral vision), we focused on the achievement domain and on establishing effects of visions on affect and behavior.

We therefore compared the *achievement vision condition* (combining a short relaxation exercise with an achievement vision) with the *no vision condition* (control condition; relaxation exercise only) with respect to their effects on implicit achievement motivation. Implicit achievement motivation was assessed by the following indicators: residualized changes in motive imagery, self-reported affective arousal, and performance (i.e., latencies and error rates) on a mental concentration task.

Changes in motive imagery. As in Study 1, we assessed residualized changes in motive imagery to indicate implicit motivation. Since Study 2 focused on the achievement domain, we used the PSE content coding system by Heckhausen (1963), which allows assessment of two components of n Achievement: hope for success and fear of failure. Individuals

predominantly high in hope for success want to do well on tasks because they associate pleasure with successful mastery of challenges, whereas individuals predominantly high in fear of failure want to do well on tasks to avoid the negative outcomes associated with the failure to master challenges independently. We hypothesized that participants in the achievement vision condition, compared to those in the no vision condition, would show an increase in hope for success imagery⁷, and that this is moderated by the participant's pre-vision hope for success, such that participants higher in pre-vision hope for success would show a greater increase in hope for success imagery than those lower in pre-vision hope for success. As the achievement vision that we used is dominated by hope for success imagery, we had no specific hypotheses for fear of failure.

Changes in self-reported affective arousal. To assess changes in self-reported affective arousal, we measured participants' energetic arousal, tense arousal, and hedonic tone. Whereas tense arousal and energetic arousal indicate a state of motivational activation that should facilitate instrumental behavior (cf., Matthews, Jones, & Chamberlain, 1990; Schultheiss & Brunstein, 1999), hedonic tone should indicate the consumption of the affectively charged reward (cf., Matthews et al., 1990; Weinberger & McClelland, 1990), which is anticipated through the visualization of a motive-congruent vision (i.e., a vision that fits the person's implicit motives

⁷ Since the achievement vision mainly offers incentives for hope for success, we do not expect an increase in fear of failure imagery in the achievement vision condition.

thematically). Both aspects, motivational activation and consumption of an affectively charged reward, are associated with implicit motivation (Weinberger & McClelland, 1990). We therefore hypothesized that participants in the achievement vision condition, as opposed to those in the no vision condition, would show an increase in energetic arousal, tense arousal, and hedonic tone. This should be moderated by the strength of the person's pre-vision hope for success, such that participants higher in pre-vision hope for success should show a greater increase in self-reported affective arousal than those lower in hope for success.

Changes in performance on a mental concentration task. Participants' performance was assessed with a mental concentration task adapted from Brunstein and Maier (2005). The authors argued that performance on this task is predicted by a participant's n Achievement if aroused by self-referenced feedback. In the present study, we used increases in performance as an indicator of the n Achievement arousal elicited by the achievement vision. We hypothesized that participants in the achievement vision condition would show better performance on the mental concentration task than those in the no vision condition, and that this effect would be moderated by participants' pre-vision hope for success, such that participants high in hope for success would show greater increases in performance than those lower in hope for success.

4.1 Method

Participants. The sample consisted of 51 students (34 women, 17 men) with an average age of 24.5 years ($SD = 3.6$ years) and none of which was involved in Study 1. All were enrolled at the Technical University of Munich or the Ludwig-Maximilian University, Munich and each received €15 for participating in the study. Participants signed up in response to fliers posted on campus. Of the initial pool of participants, two were dropped from the analyses because they were either not German native speakers ($n = 1$), or dropped out of the study ($n = 1$). The final data set was based on 49 participants (33 women, 16 men) with a mean age of 24.2 years ($SD = 3.0$ years).

Design. Again, the study had an ATI-design, with hope for success and fear of failure as between-subjects aptitude factors and vision condition as treatment factor with two levels to which participants were randomly assigned (achievement vision condition, $n = 24$; no vision condition, $n = 25$). The dependent variables were residualized changes in performance on a mental concentration task (i.e., latencies and error rate), achievement imagery (i.e., hope for success, and fear of failure imagery), and self-reported affective arousal (i.e., hedonic tone, tense arousal, and energetic arousal).

Procedure. Each participant attended a session lasting about 60 minutes. First, participants completed the pre-vision PSE for the assessment of hope for success and fear of failure. They then worked on the first mental

concentration task followed by the self-report measure for affective arousal, the UWIST Mood Adjective Check List (UMACL; Matthews et al., 1990). Participants were then administered either the achievement vision or the relaxation exercise (see below). This was followed by the post-vision measurements: Participants again completed the UMACL, then worked on the second mental concentration task, completed the post-vision PSE that paralleled the pre-vision PSE in incentive value, and provided demographic information. Finally, they were thanked and debriefed.

Vision administration. The method of the vision administration was the same as in Study 1, with exception of the length and content of the vision scripts: In the achievement vision condition, participants listened to a guided visualization starting with a short relaxation exercise (5 min) followed by a vivid description of a graduation ceremony (7 min) which was, in contrast to Study 1, cast in a purely achievement-related frame (e.g., success at the university and later in the job), while in the no vision condition, participants listened only to the relaxation exercise⁸.

Implicit motives. We assessed n Achievement in its two subcomponents hope for success and fear of failure using the PSE. We used the same methods as in Study 1 for administration and content-coding of the PSE and for the treatment of the resulting motive scores, with the exception

⁸ We decided to replace the neutral vision of Study 1 by a pure relaxation exercise as some participants in Study 1 reported a meditative effect of the visualization of the triangle.

of the PSE pictures and the PSE content-coding system: The pre-vision PSE consisted of four pictures, which were chosen specifically to arouse n Achievement; the pictures *the gymnast* and *women in a laboratory* have been used in earlier studies (e.g., Brunstein & Maier, 2005; Pang & Schultheiss, 2005), while the pictures *lecture hall* and *graduation ceremony* (see Appendix B) had not been used before. The post-vision PSE consisted of *the pianist* (Pang, in press) and *the workers* (Smith, 1992) and a third picture, *the tutoring lesson* (see Appendix B), which had not been used before. The resulting protocols were scored for motive imagery according to Heckhausen's (1963) content-coding system, in which scorers identify the presence or absence of coding categories under the hope for success and fear of failure coding sub-systems. According to the manual, hope for success is scored whenever a story character shows a concern related to a positively-framed achievement goal, shows any activity instrumental to reaching the achievement goal or completing a task without the help of others, expresses expectations of success, praises or rewards another character for good performance, or shows positive affect about a good performance. Fear of failure is coded whenever a story character shows a concern related to avoiding failure within an achievement-related context, shows an activity instrumental to avoiding failure or to dispelling the consequences of past failure, expects to fail in the course of an achievement-related activity, criticizes the performance of another character, experiences negative affect

associated with a failure or a lack of progress, fails to achieve a goal, or mentions a past failure.

As in Study 1, PSE stories were blindly content-coded by a coder who had previously exceeded 85% inter-scorer agreement on calibration materials pre-scored by an expert. To additionally ensure a sufficient inter-rater reliability, 25% of the PSE stories were additionally content-coded by a second independent coder. The two coders achieved a percentage category agreement of 95.95% for hope for success and 88.07% for fear of failure. Participants' means were $M = 372.88$ ($SD = 103.36$) for pre-vision protocol length, $M = 298.69$ ($SD = 87.28$) for post-vision protocol length, $M = 8.39$ ($SD = 3.28$) for pre-vision hope for success, $M = 1.16$ ($SD = 1.40$) for pre-vision fear of failure, $M = 3.96$ ($SD = 2.81$) for post-vision hope for success, and $M = 1.76$ ($SD = 1.61$) for post-vision fear of failure. Because PSE protocol lengths were not correlated with participants' overall motive scores ($ps > .20$), motive scores were not corrected for protocol length. We conducted a square-root transformation with all pre- and post-vision motive scores in order to bring them into closer alignment with a normal distribution.

Mental concentration task performance. The mental concentration task is an adaption of Brickenkamp and Zillmer's (1998) d2 Test of Attention, which is a test designed to assess individual differences in perceptual speed and selective attention. A similar task was used by Brunstein and Schmitt (2004). Mastering this task requires a great deal of mental effort, making it an appropriate instrument to assess the effects of achievement motivation.

During the task, the letters *d* and *p* are displayed at the center of the computer monitor. The letters are accompanied by one, two, or three vertical or horizontal dashes. Participants press one key if a target (i.e., a *d* with two dashes) is presented and press another key if a non-target (i.e., a *d* having more or fewer than two dashes, or a *p* no matter how many dashes it had) is presented. Participants are instructed to perform as fast and as accurately as possible. To ensure some familiarity with the task, they first work on a set of practice trials, which in our study ended when they had given ten correct responses. Before starting the task proper, participants saw the instructions again and were reminded to maintain both speed and accuracy. The following pre-vision block consisted of 150 trials, whereas the post-vision block consisted of 300 trials. Targets and non-targets were presented in a random order. Stimuli remained on the screen until the participant had pressed one of the two keys before the next stimulus was presented. In contrast to Brunstein and Schmitt's version of this task, participants did not receive feedback. We did this to avoid the motivational effect of feedback interfering with the motivational effect of the achievement vision. To minimize the effect of response errors, we removed latencies greater than 1,200 ms and less than 300 ms, which led to the loss of less than 4% of the data in the pre-vision block and less than 2% in the post-vision block. To estimate pre-vision latencies ($M = 647.95$, $SD = 80.99$), we then averaged latencies of all trials in the pre-vision block, and for post-vision latencies ($M = 589.81$, $SD = 67.49$) we averaged all latencies in the post-vision block. Because pre- and post-

vision blocks differed in number of trials, we calculated error rates (N errors/N trials; $M = 0.034$, $SD = 0.025$ for pre-vision; $M = 0.032$, $SD = 0.027$ for post-vision). As distributions of error rates and latencies were skewed, we conducted a square-root transformation with the latencies and a log-transformation with the error rates.

Self-reported affective arousal. Participants' pre-vision (T1) and post-vision (T2) affective arousal was assessed with a measure adapted from the UMACL. Four items were taken from the *energetic arousal* scale (*active*, *energetic*, *passive*, and *sluggish*) and four from the *tense arousal* scale (*nervous*, *jittery*, *calm*, and *relaxed*; cf. Schultheiss & Brunstein, 1999). The *hedonic tone* scale (consisting of eight items: *happy*, *satisfied*, *contented*, *cheerful*, *sad*, *depressed*, *dissatisfied*, and *sorry*) was used in its entirety. Items were presented in random order with the primer "Right now I feel. . ." and participants could endorse each item on a 4-point scale featuring the gradations *definitely not*, *slightly not*, *slightly*, and *definitely*. After recoding of negatively keyed items, sum scores were calculated for each scale and each assessment, because all scales were found to have satisfactory internal consistency at T1 and T2 (Cronbach's α ranging from .60 to .89). Participants' means were 23.88 ($SD = 4.68$) for pre-vision hedonic tone, 25.41 ($SD = 4.06$) for post-vision hedonic tone, 11.86 ($SD = 2.73$) for pre-vision energetic arousal, 11.92 ($SD = 2.78$) for post-vision energetic arousal, $M = 7.10$ ($SD = 2.22$) for pre-vision tense arousal, and 6.41 ($SD = 1.91$) for post-vision tense arousal.

4.2 Results

Preliminary analyses. Table 2 displays the intercorrelations of all variables. Participants' pre-vision motive scores (i.e., hope for success and fear of failure) did not differ significantly across the two experimental conditions ($ps > .40$). Also, participants' gender and age had no impact on the results reported below.

Motive imagery. To test whether the achievement vision caused an increase in hope for success imagery, we conducted an ANCOVA on post-vision hope for success imagery with vision condition as the factor and pre-vision hope for success as a covariate. The analysis revealed a significant effect of vision condition on post-vision hope for success imagery, $F(1, 46) = 4.98, p = .03$. As displayed in Figure 4, participants in the achievement vision condition showed a greater increase in hope for success imagery than those in the no vision condition. However, the increase of hope for success imagery was not moderated by the pre-vision hope for success, $F(1, 45) = 0.22, p = .64$. Furthermore, we did not find any main effect of vision condition on changes in fear of failure imagery.

Table 2
Correlations for pre-vision implicit motives, post-vision motive imagery, pre-and post-vision performance in mental concentration task, and pre-and post-vision self-reported affective arousal in Study 2.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Pre-vision implicit motive scores</i>														
1. Hope for success	--													
2. Fear of failure	-.05	--												
<i>Post-vision motive imagery scores</i>														
3. Post-vision hope for success	.45***	-.04	--											
4. Post-vision fear of failure	.23	.42***	-.05	--										
<i>Pre- and post-vision performance scores</i>														
5. Pre-vision reaction times	.46***	-.05	.42***	.08	--									
6. Post-vision reaction times	.49***	-.15	.32*	.13	.91***	--								
7. Pre-vision error rates	-.23	.10	-.22	.08	-.43***	-.39***	--							
8. Post-vision error rates	-.25	.09	-.24	-.00	-.43***	-.45***	.63***	--						
<i>Pre- and post-vision affective arousal scores</i>														
9. Pre-vision hedonic tone	-.11	-.10	-.12	.03	-.38**	-.40***	.14	.15	--					
10. Post-vision hedonic tone	-.11	-.11	-.16	-.02	-.22	-.20	.26	.26	.65***	--				
11. Pre-vision tense arousal	.08	.01	.05	.01	.08	.09	.01	-.10	-.32*	-.14--				
12. Post-vision tense arousal	-.02	.09	.25	-.07	.13	.08	-.23	-.26	-.39**	-.48***	.43***	--		
13. Pre-vision energetic arousal	.08	-.14	-.02	-.04	-.29*	-.26	.11	.06	.48***	.44***	.11	-.16	--	
14. Post-vision energetic arousal	-.11	.05	-.05	-.07	-.12	-.18	-.16	.13	.32*	.54***	.05	-.02	.67***	--

Note. * $p < .05$; ** $p < .01$; *** $p < .005$. Pre-vision motive scores, post-vision motive imagery scores, and pre- and post-vision reaction time scores are square-root-transformed; Pre- and post-vision error rate scores are log-transformed.

Figure 4. Effects of vision condition on residualized change scores (z scores) in hope for success imagery. Error bars represent the standard error of the mean.

Self-reported affective arousal. To test the achievement vision's effects on self-reported affective arousal, we conducted an ANCOVA on post-vision affective arousal with vision condition as the factor and pre-vision affective arousal as a covariate.

The analysis of hedonic tone did not reveal any significant effect of either vision condition by itself, $F(1, 46) = 0.31, p = .58$, or in interaction with pre-vision hope for success, $F(1, 44) = 0.20, p = .66$, or fear of failure, $F(1, 44) = 0.00, p = .97$.

The analysis of tense arousal revealed that participants in the achievement vision condition, compared to those in the no-vision condition,

showed significant increases in tense arousal, $F(1, 46) = 7.75, p = .008$ (see Figure 5). However, this increase was not moderated by pre-vision hope for success, $F(1, 44) = 0.22, p = .64$, fear of failure, $F(1, 44) = 2.38, p = .13$, or both $F(1, 40) = 1.56, p = .44$.

Figure 5. Effects of vision condition on residualized change scores in tense arousal (z scores). Error bars represent the standard error of the mean.

For energetic arousal, we found no main effect of vision condition, $F(1, 46) = 0.93, p = .34$. However, when including pre-vision hope for success as a second predictor in the analysis, we found a significant interaction of Pre-Vision Hope for Success x Vision Condition on changes in energetic arousal, $F(1, 44) = 4.78, p = .03$ (see Figure 6), whereas the interaction of Pre-Vision Fear of Failure x Vision Condition was not significant, $F(1, 44) = 2.45, p = .12$.

As displayed in Figure 6, in the no-vision condition, pre-vision hope for success predicts a decrease in energetic arousal, whereas in the achievement vision condition, pre-vision hope for success is slightly positively associated with energetic arousal.

Figure 6. Residualized changes in energetic arousal (z scores) as a function of pre-vision hope for success and vision condition. Solid line/filled dots: no vision condition; striped line/crosses: achievement vision condition.

Concentration task performance. To test the hypothesis that the achievement vision condition, compared to the no vision condition, increases performance (i.e., reduces latencies and error rates) on the mental concentration task, we conducted an ANCOVA on post-vision performance with vision condition as the factor and pre-vision performance as a covariate. For the latencies, the analysis revealed that participants in the achievement

vision condition, compared to those in the no-vision condition, showed significant reductions in latencies, $F(1, 46) = 7.83, p = .007$ (see Figure 7). This reduction in latencies was not moderated by pre-vision hope for success, $F(1, 44) = 0.01, p = .90$, or pre-vision fear of failure $F(1, 44) = 2.55, p = .12$.

Figure 7. Effects of vision condition on residualized changes in latencies (z scores). Error bars represent the standard error of the mean.

However, when simultaneously including pre-vision hope for success and fear of failure in the analysis, we found a significant interaction effect of Vision Condition x Pre-Vision Hope for Success x Pre-Vision Fear of Failure on residualized changes in latencies, $F(1, 40) = 17.90, p = .0001$. This significant triple interaction uniquely accounted for a variance increment of 5.07% in post-vision latencies. As depicted in Figure 8, in the no vision

condition, participants high in pre-vision hope for success show the greatest increases in latencies. In the achievement vision condition, however, it were participants high in pre-vision hope for success and low in pre-vision fear of failure or those high in pre-vision fear of failure and low in pre-vision hope for success who showed reductions in latencies. Participants low in both components of n Achievement, however, did not benefit from the achievement vision. They showed increasing latencies, which might be due to the low strength of n Achievement. The same is true for participants who are high in both pre-vision fear of failure and hope for success.

Figure 8. Three-variable scatter plot with distance-weighted least-squares smoothing showing effects of pre-vision hope for success and fear of failure on residualized change scores in latencies (z scores) by condition.

Error rate analyses revealed that participants in the achievement vision condition, relative to the no-vision condition, showed significant reductions in error rates, $F(1, 46) = 4.93$, $p = .03$ (see Figure 9). This decrease was not

moderated by pre-vision hope for success, $F(1, 44) = 0.07$, $p = .79$, pre-vision fear of failure, $F(1, 44) = 0.37$, $p = .55$, or both, $F(1, 40) = 1.30$, $p = .26^9$.

Figure 9. Effects of vision condition on residualized change scores in error rates (z scores). Error bars represent the standard error of the mean.

⁹ In order to contrast implicit motives and explicit motives in terms of their relevance for the motivational effects of visions, we also assessed participants' explicit achievement motive (cf. McClelland et al., 1989) with the scale *achievement* taken from the German version of the Personality Research Form (PRF; Stumpf, Angleitner, Wieck, Jackson, & Beloch-Till, 1985). The explicit achievement motive, either by itself or in interaction with vision condition or n Achievement, did not explain any significant portion of variance in the non-declarative indicators of motivation (i.e., changes in motive imagery and performance). Regarding the declarative measure (i.e., self-reported affective arousal), the only significant effect was the interaction of vision condition x explicit achievement motive on energetic arousal changes, $F(1, 44) = 7.05$, $p = .01$. Only in the achievement vision condition did the explicit achievement motive positively predict changes in energetic arousal.

4.3 Discussion

The results of Study 2 lend support to our hypotheses. Replicating the vision's effects on motive imagery of Study 1, the achievement vision increased hope for success imagery in all participants. However, this was not moderated by the strength of participants' pre-vision n Achievement (see Study 1 for a discussion of the missing moderator effect).

Findings on self-reported affective arousal support our proposition that the achievement vision indeed promoted a state of motivational activation. However, the increase in tense arousal is not moderated by the participant's pre-vision n Achievement. The effect on energetic arousal, in contrast, depends on the strength of the participants' pre-vision hope for success. In the no-vision condition, participants high in hope for success showed a decrease in energetic arousal, yet in the achievement vision condition, they showed a slight increase in energetic arousal. This finding suggests that the achievement vision helps individuals high in hope for success to maintain the energetic activation required to complete the task. However, we did not find any effect of the achievement vision on hedonic tone. This implies that the achievement vision does not trigger vicarious motive satisfaction but instead a state of pure motivational activation. This motivational activation is also reflected by manifest behavioral performance indicators. The achievement vision indeed promoted higher performance on the mental concentration task.

Participants in the achievement vision condition were faster and made fewer errors on the mental concentration task than those in the no vision condition. In terms of latencies, this was particularly the case for individuals high either in hope for success or fear of failure. However, individuals high in both hope for success and fear of failure showed increasing latencies. This implies that the achievement vision has aroused contradictory action tendencies (approach and avoidance), which perhaps interfere with each other and inhibit behavior (see also Gray & McNaughton, 2000). In terms of error rates, the benefits of the achievement vision were independent of the participant's pre-vision n Achievement. In sum, these findings support the notion that the achievement vision elicits implicit achievement motivation in terms of orientation of attention, as well as energization of instrumental behavior.

5 STUDY 3—EFFECTS OF AFFILIATION AND POWER VISIONS ON ALPHA-AMYLASE, COOPERATION BEHAVIOR IN A PRISONER'S DILEMMA, AND AFFECTIVE AROUSAL

Study 2 focused on the motivational effects of an achievement vision and examined the moderating effect of the person's n Achievement on the link between an achievement vision and implicit achievement motivation. Following on from this, Study 3 intended to replicate these findings for the domains of affiliation and power. By comparing n Affiliation and n Power, we intended to contrast two implicit motives that are known to have opposite effects on many motivational outcomes (McClelland, 1989). Therefore, we chose motivation indicators which would illustrate these opposing effects: changes in salivary alpha-amylase, changes in self-reported affective arousal, and cooperation behavior in a prisoner's dilemma. The investigation of changes in alpha-amylase, an enzymatic indicator of sympathetic arousal, and self-reported affective arousal should allow us to replicate the energizing effect of visions. Assessing cooperative vs. exploitive behavior in a prisoner's dilemma additionally allows us to test the effect of visions on the selection of behavior.

Changes in salivary alpha-amylase. Recent research has shown that salivary alpha-amylase is a sensitive biomarker for stress-related changes in

the body reflecting the activity of the sympathetic nervous system (Chatterton et al., 1996; Nater & Rohleder, 2009). Moreover, McClelland and his colleagues (McClelland, 1989; McClelland, Floor, Davidson, & Saron, 1980) have shown that n Power is associated with the activity of the sympathetic nervous system. They found that a combination of high n Power and life stress is associated with sympathetic activation and the release of stress hormones (i.e., salivary immunoglobulin A and norepinephrine; Jemmott, Borysenko, Borysenko, et al., 1983; McClelland, 1989). Therefore, we hypothesized that in the power vision condition, but not in the affiliation vision condition, the strength of n Power should positively predict increases in salivary alpha-amylase.

Changes in self-reported affective arousal. Prior research has demonstrated that n Power arousal is associated with increases in energetic arousal and tense arousal (McClelland, 1982). N Affiliation arousal, in contrast, is associated with the experience of joy and pleasure (McClelland, 1985), which can be assessed by the hedonic tone scale (UMACL). Hence, we propose that the affiliation vision condition lead to increases in hedonic tone and that this is moderated by the strength of n Affiliation, such that participants higher in n Affiliation show a greater increase in hedonic tone than those lower in n Affiliation. Furthermore, we expected that the power vision condition would lead to increases in tense arousal and energetic arousal, and that this would be moderated by the strength of n Power, such

that participants higher in n Power would show a greater increase in energetic and tense arousal than those lower in n Power.

Cooperation behavior. Prior research has shown that a person's implicit motives influence cooperation behavior. In studies using the prisoner's dilemma paradigm, participants high in n Power were consistently non-cooperative and tried to exploit their partners, whereas participants high in n Affiliation were mainly cooperative (Kagan & Knight, 1981), especially if the payoff matrix implied a 'safe' game (i.e., if for both partners wins of cooperative behavior were relatively high and the temptation of exploitive behavior relatively low; Terhune, 1968). Consequently, a payoff matrix implying a rather safe game differentiates best between n Affiliation arousal and n Power arousal: N Affiliation arousal should lead to cooperative behavior, whereas n Power arousal should lead to exploitive behavior. Therefore, we hypothesized that the power vision condition, compared to the affiliation vision condition, would lead to exploitive behavior, and that this would be moderated by the strength of n Power, such that participants higher in n Power would show a greater increase in exploitive behavior than those lower in n Power. Similarly, the affiliation vision condition, compared to the power vision condition, should lead to cooperation behavior which is moderated by the strength of n Affiliation, such that participants higher in n Affiliation should show a greater increase in cooperation behavior than those lower in n Affiliation.

5.1 Method

Participants. The sample consisted of 51 students (28 women, 23 men) with a mean age of 23.92 years ($SD = 3.72$ years), and none of which were involved in Study 1 or 2. Participants were enrolled at the Technical University of Munich or the Ludwig-Maximilian University, Munich. They participated for payment of about €19 (i.e., €10 plus another €8.40 to €9.40 that could be earned in the prisoner's dilemma game) and signed up in response to fliers posted on campus. The study had received prior approval by the ethics committee of the Technical University of Munich and all participants provided informed consent. Of the initial sample, one participant was dropped from the analyses because he showed a strong emotional reaction to the vision and so withdrew from the experiment. Due to technical problems, two participants did not complete the full PSE. However, this had no effect on the results reported below, so we did not exclude them from analyses. The final data set was based on 50 participants (28 women, 22 men) with a mean age of 24 years ($SD = 3.71$ years).

Design. We again used an ATI-design with n Affiliation and n Power as between-subjects aptitude factors and vision condition as treatment factor with two levels to which participants were randomly assigned (affiliation vision condition, $n = 26$; power vision condition, $n = 24$). The dependent variables were residualized change scores of salivary alpha-amylase, self-reported

affective arousal (i.e., hedonic tone, tense arousal, and energetic arousal), and cooperation behavior in a prisoner's dilemma.

Procedure. Each participant attended a session lasting about 100 minutes. First, participants provided a saliva sample for the assessment of baseline alpha-amylase followed by the self-report measure for affective arousal, the UMACL (Matthews et al., 1990). Participants then completed the PSE for the assessment of n Affiliation, n Power, and n Achievement before they were administered the guided visualization of either the affiliation or the power vision (see below). This was followed by the post-vision measurements: Participants again completed the UMACL, then played the prisoner's dilemma, and provided demographic information. Finally, they were debriefed and thanked.

Vision administration. The method of the vision administration was the same as in Studies 1 and 2, with exception of the length and content of the vision scripts (see Appendix A): Participants listened to a guided visualization starting with a short relaxation exercise (5 min) and followed by a vivid description of the affiliation vision (6 min) or the power vision (7 min). In contrast to Study 1 and 2, we used the scenario of a private graduation party instead of the official graduation ceremony¹⁰. The scenario was cast in either a power- or an affiliation-related frame. In the power vision, participants imagined themselves being the host of the party, being the focus of attention,

¹⁰ We chose the private graduation party instead of the official ceremony as it was easier to cast in an affiliation-thematic frame.

and giving a speech for the guests. In the affiliation vision, participants imagined themselves enjoying being surrounded by family and friends.

Implicit motives. The same method of assessing implicit motives was used as in Study 1 and 2, except that we only administered a pre-vision PSE and no post-vision PSE. The PSE consisted of the same six pictures as the pre-vision PSE in Study 1. PSE stories were blindly content-coded by a coder using Winter's (1994) *Manual for Scoring Motive Imagery in Running Text*. The coder had previously exceeded 85% inter-scorer agreement on calibration materials prescored by an expert. Again, 25% of the PSE stories were additionally content-coded by a second independent coder. The two coders achieved a percentage category agreement of 91.4% for n Affiliation, and 96.2% for n Power.

We conducted a square-root transformation with all motive scores and a log-transformation with the word count in order to bring them into closer alignment with a normal distribution. PSE protocol length ($M = 567.20$, $SD = 161.32$) was significantly correlated with participants' n Power ($M = 5.16$, $SD = 2.87$), $p = .01$, $r = .36$, and n Affiliation ($M = 4.68$, $SD = 2.69$), $r = .44$, $p < .005$. Therefore, we corrected the motive scores for the influence of protocol length by regression. Finally, following the recommendations of Cohen et al. (2003), we converted the residuals to z scores.

Salivary alpha-amylase. Pre-vision saliva samples were taken at the beginning of each session, and post-vision salivary samples were collected approximately 15 to 20 min after the vision had been administered. Samples

were taken between 12 p.m. and 6 p.m. to control for circadian declines in amylase levels (i.e., the strong decrease after waking-up; Rohleder & Nater, 2009). The samples were collected using the same method as in Study 1. Alpha-amylase analyses were conducted by the Kirschbaum Hormone Laboratory at the Technical University of Dresden, Germany, using the following quantitative enzyme kinetic method. After thawing, saliva samples were centrifuged at 3000 rpm for 3 min. After this, saliva was diluted in the ratio 1:625 with double-distilled water. Then, 20 μ l of diluted saliva and standard were transferred into transparent 96-well microplates (Roth, Germany). Standard was prepared from calibrator solutions (Roche Diagnostics, Mannheim, Germany) ranging from 5.01 to 326 U/L Amylase, and double-distilled water as a zero standard. After that, 80 μ l of substrate reagent (α -Amylase EPS Sys; Roche Diagnostics) was added. The microplate was then heated in an incubator at 43°C for 90 s. After a first interference measurement at 405 nm using a standard interference photometer (Sunrise-Basic Tecan, Tecan Austria GmbH, Grödig, Austria), the plate was incubated for another 5 min at 43°C, and the second measurement was taken. Increases of absorbance of samples were transformed to α -amylase activity using a linear regression calculated for the standard curve on each microplate (GraphPad Prism 4.0c for MacOSX, GraphPad Software, and San Diego, USA). Intra- and inter-assay precision expressed as percent CV was below 10%. As alpha-amylase data were skewed, they were log-transformed prior to all statistical analysis.

Self-reported affective arousal. Participants' pre-vision and post-vision affective arousal was assessed using the same instrument as in Study 2. Because all scales were found to have satisfactory internal consistency (Cronbach's α ranging from .75 to .88), sum scores were calculated for each scale and each assessment. Participants' means were 24.84 ($SD = 3.64$) for pre-vision hedonic tone, 25.78 ($SD = 4.50$) for post-vision hedonic tone, 12.26 ($SD = 2.56$) for pre-vision energetic arousal, 12.04 ($SD = 2.66$) for post-vision energetic arousal, 8.92 ($SD = 2.54$) for pre-vision tense arousal, and 7.24 ($SD = 2.31$) for post-vision tense arousal. We conducted a square-root transformation with all scores except for the pre-vision score of energetic arousal, in order to bring them into closer alignment with a normal distribution.

Prisoner's dilemma. The prisoner's dilemma we used was adapted from Terhune (1968). The prisoner's dilemma is referred to as a mixed-motive game, because each player must decide between trying to cooperate with his partner at the risk of being double-crossed, and trying to win the most for himself, with the risk of gaining little if his partner tries the same.

The prisoner's dilemma consisted of 10 trials which were arranged in two phases: the no-feedback phase and the feedback phase. First, in the no-feedback phase, participants played three trials in which they recorded their decisions without feedback about the outcome. By not providing feedback, the effect of the motives could be assessed without the contaminating influence of interaction with the game partner. In the feedback phase, participants were informed that they would receive outcome feedback, but the

partner would not. Herein, we varied between cooperation and non-cooperation feedback. To avoid participants high in *n* Affiliation becoming suspicious and defensive because of too defensive a partner (cf. Terhune, 1968), participants mostly received cooperation feedback, apart from the fifth trial and the final trial.

Participants received on-screen instructions which informed them that both partners play for points, which are accumulated over the trials, and that the final payoff in money is made at the rate of 1 Eurocent per point. They were also told that the number of points earned depends on their own decisions and on the decisions of their partner. The payoff matrix was then shown to the participants, and the way in which their respective payoffs were contingent on their joint choices was explained: If both players chose cooperation, each would receive 60 points. If both chose non-cooperation, each would receive 20 points. If one player chose non-cooperation when the other chose cooperation, the non-cooperation-chooser would receive 65 points, while the Cooperation-chooser would receive only 15 points.

In order to standardize conditions (i.e., reactions of the game partner) and to avoid direct social interaction interfering with the effects of the vision, we decided to let participants compete against a computer. Yet, as *n* Power and *n* Affiliation are social motives that respond to interaction with another person, we informed participants that they were competing against a real game partner in the adjacent room. Consistent with this framing of the experiment as one that is completed in pairs, participants had previously

received an invitation email asking them to arrive at the experiment on time. Furthermore, after the participant had been seated and given instructions, the experimenter promptly left the room ostensibly to attend to the other participant. Additionally, the prisoner's dilemma was multiply interrupted by the information "waiting for partner" on the screen.

Since choices after all three types of feedback (i.e., no feedback, negative feedback, and positive feedback) were significantly and positively correlated ($r_s > .29$, $p_s < .04$) and analyses of cooperation behavior differentiating between the three feedback types did not differ substantially from those conducted with an overall cooperation score, we computed an overall cooperation score ($M = 4.05$, $SD = 4.00$) by summing all cooperation choices regardless of the feedback type. As cooperation scores were skewed, they were square-root-transformed prior to all statistical analyses.

5.2 Results

Preliminary analyses. Table 3 displays the intercorrelations of all variables. Participants' pre-vision motive scores (i.e., n Affiliation and n Power) did not significantly differ across the experimental conditions ($p_s > .21$). Also, participants' age had no impact on the results reported below. Gender, however, had an impact on some effects as reported below.

Table 3

Correlations for pre-vision implicit motives, post-vision pre-and post-vision self-reported affective arousal, pre- and post-vision alpha-amylase levels, and post-vision cooperation behavior in a prisoner's dilemma in Study 3.

	1	2	3	4	5	6	7	8	9	10	11
<i>Pre-vision implicit motive scores</i>											
1. n Affiliation	--										
2. n Power	-.18	--									
<i>Pre- and post-vision affective arousal scores</i>											
3. Pre-vision hedonic tone	-.04	-.23	--								
4. Post-vision hedonic tone	.04	-.20	.30*	--							
5. Pre-vision tense arousal	.04	-.04	-.23	-.11	--						
6. Post-vision tense arousal	.05	.08	-.14	-.32*	.33*	--					
7. Pre-vision energetic arousal	.20	-.40**	.53***	.28*	-.04	.01	--				
8. Post-vision energetic arousal	-.02	-.11	.22	.44***	-.17	-.08	.42***	--			
<i>Pre- and post-vision alpha-amylase levels</i>											
9. Pre-vision alpha amylase	-.06	.12	-.12	-.24	.20	.11	.12	.06	--		
10. Post vision alpha amylase	-.10	.08	-.18	-.22	.12	.15	-.01	.06	.86***	--	
<i>Post-vision cooperation behavior</i>											
11. Post-vision cooperation behavior	.24	-.35*	.08	.25	.12	-.12	.22	.14	.00	-.14	--

Note. * $p < .05$; ** $p < .01$; *** $p < .005$. Pre- and post-vision self-reported affect scores (apart from pre-vision energetic arousal) are square-root-transformed, pre-and post vision alpha-amylase levels are log-transformed.

Self-reported affective arousal. To test the proposition that the affiliation vision increases self-reported hedonic tone, whereas the power vision increases energetic as well as tense arousal, we conducted ANCOVAs on post-vision self-reported affective arousal with vision condition and n Affiliation as factors and pre-vision self-reported affective arousal as a covariate.

The analysis for hedonic tone revealed that participants in the affiliation vision condition, relative to the power vision condition, showed significant increases in hedonic tone, $F(1, 47) = 7.44, p = .009$ (see Figure 10).

Figure 10. Effects of vision condition on residualized change scores in hedonic tone and tense arousal. Error bars represent the standard error of the mean.

As predicted, this effect was moderated by the strength of participants' n Affiliation, $F(1, 45) = 4.08, p < .05$. As displayed in Figure 11, participants' n Affiliation was a non-significant positive predictor of hedonic tone in the affiliation vision condition, $B = 0.13, SE = 0.09, t(23) = 1.43, p = .165$. In contrast, in the power condition, n Affiliation was a non-significant negative predictor of hedonic tone, $B = -0.10, SE = 0.07, t(21) = -1.37, p = .185$. This significant interaction uniquely accounted for a variance increment of 3.61% in post-vision hedonic tone.

Figure 11. Residualized changes in hedonic tone as a function of pre-vision n Affiliation (z scores) and vision condition. Striped line/crosses: affiliation vision condition; solid line/filled dots: power vision condition.

Analysis for tense arousal showed that participants in the power vision condition, compared to those in the affiliation vision condition, showed significant increases in tense arousal, $F(1, 47) = 4.42, p = .04$ (see Figure 10). However, the interaction effect of Vision Condition x n Power failed to reach significance ($p = .17$). Hence, the power vision increased tense arousal in all participants, regardless of the strength of their n Power.

For energetic arousal, the analysis revealed no main effect of vision condition on changes in energetic arousal, $F(1, 47) = 1.95, p = .17$. However, when including n Power in the analysis, the interaction of n Power x Vision Condition on residualized changes in energetic arousal became significant, $F(1, 45) = 4.60, p = .04$. As can be seen in Figure 12, the higher the participants' n Power, the greater the increases in energetic arousal in the power vision condition, $B = 0.16, SE = 0.09, t(21) = 1.86, p = .076$. In contrast, in the affiliation vision condition, n Power was a non-significant negative predictor of energetic arousal, $B = -0.09, SE = 0.07, t(23) = 0.90, p = .19$. This significant interaction uniquely accounted for a variance increment of 7.31% in post-vision energetic arousal. Furthermore, gender had an impact on this interaction effect, $F(1, 144) = 8.54, p = .005$: The interaction effect was present among the males, $F(1, 17) = 17.32, p = .0007$, whereas in the females it failed to reach significance, $F(1, 23) = 0.12, p = .73$. Hence, in terms of energetic arousal, the vision had a strong effect on men but no effect on women.

Figure 12. Residualized changes in energetic arousal as a function of pre-vision n Power (z scores) and vision condition. Striped line/crosses: affiliation vision condition; solid line/filled dots: power vision condition.

Salivary alpha-amylase. To test the proposition that in the power vision condition the strength of pre-vision n Power predicts the increase in salivary alpha-amylase, we conducted an ANCOVA on post-vision alpha-amylase with pre-vision n Power and vision condition as predictors and pre-vision alpha-amylase as a covariate. As predicted, none of the first-order predictors was significant, but the interaction effect of n Power x Vision Condition on residualized changes in alpha-amylase reached statistical significance, $F(1, 43) = 4.28, p = .04$ (see Figure 13). In the power vision condition, participants' n Power positively predicted increases in alpha-amylase, $B = 0.19, SE = 0.07$,

$t(19) = 2.59, p = .018$. In contrast, in the affiliation vision condition, *n* Power was a non-significant negative predictor of alpha-amylase changes, $B = -0.08$, $SE = 0.10, t(23) = 0.78, p = .44$. After controlling for pre-vision alpha-amylase and the first-order terms of *n* Power and vision condition, this interaction uniquely accounted for a variance increment of 2.27% in post-vision alpha-amylase.

Figure 13. Residualized changes in salivary alpha-amylase as a function of pre-vision *n* Power (z scores) and vision condition. Striped line/crosses: affiliation vision condition; solid line/filled dots: power vision condition.

Cooperation behavior in a prisoner's dilemma. To test the hypothesis that the affiliation vision promoted cooperation behavior, especially in participants high in *n* Affiliation, whereas the power vision promoted exploitive behavior, especially in participants high in *n* Power, we conducted ANOVAs

on cooperation behavior with vision condition and implicit motives as factors¹¹.

The analyses revealed a significant main effect of vision condition on cooperation behavior, $F(1, 43) = 4.28, p = .04$. Participants in the affiliation vision condition showed significantly more cooperation behavior than those in the power vision condition (see Figure 14).

Figure 14. Effects of vision condition on cooperation behavior in the prisoner's dilemma. Error bars represent the standard error of the mean.

As predicted, this effect was moderated by n Power, $F(1, 46) = 5.23, p = .03$. In the power vision condition, participants' n Power negatively predicted

¹¹ We additionally controlled for effects of n Achievement on cooperation behavior. Analyses revealed no significant effects of n Achievement on the results reported below.

cooperation behavior, $B = -0.21$, $SE = 0.07$, $t(22) = -2.91$, $p < .01$ (see figure 15). In contrast, in the affiliation vision condition, n Power was a non-significant negative predictor of cooperation behavior, $B = -0.009$, $SE = 0.06$, $t(24) = 0.14$, $p = .89$. After controlling for the impact of the first-order terms n Power and vision condition, this significant interaction accounted for 7.06% of the variance in cooperation behavior. Although the interaction of n Affiliation $\times$ Vision Condition on cooperation behavior failed to reach significance, it was in the predicted direction (i.e., in the opposite direction of the interaction effect of n Power $\times$ Vision Condition).

Figure 15. Cooperation behavior in the prisoner's dilemma as a function of pre-vision n Power (z scores) and vision condition. Striped line/crosses: affiliation vision condition; solid line/filled dots: power vision condition.

As we have directional hypotheses for *n* Power and *n* Affiliation with vision condition on cooperation behavior that go in opposite directions, we controlled for the variance overlap of *n* Affiliation and *n* Power by including *n* Affiliation and *n* Power simultaneously in the analysis. The ANOVA on cooperation behavior with vision condition, *n* Affiliation, and *n* Power as factors revealed a significant interaction effect of *n* Power x Vision Condition, $F(1, 44) = 7.98$, $p = .007$. As can be seen in Figure 16, *n* Power residualized for the impact of *n* Affiliation was associated with less cooperation behavior in the power vision condition, $B = -0.21$, $SE = 0.07$, $t(22) = -2.90$, $p = .008$, but not in the affiliation vision condition, $B = 0.04$, $SE = 0.06$, $t(24) = 0.54$, $p = .58$. This interaction accounted for a variance increment of 10.87% in cooperation behavior.

Figure 16. Cooperation behavior as a function of pre-vision *n* Power residualized for *n* Affiliation (z scores) and vision condition. Striped line/crosses: affiliation vision condition; solid line/filled dots: power vision condition.

Figure 17. Cooperation behavior in the prisoner's dilemma as a function of pre-vision *n* Affiliation residualized for *n* Power (z scores) and vision condition. Striped line/crosses: affiliation vision condition; solid line/filled dots: power vision condition.

Additional analyses. To test whether a person's pre-vision *n* Affiliation or *n* Power had an effect on cooperation behavior that is independent of the vision's effects, we regressed cooperation behavior on the implicit motive scores. The analysis for *n* Power indicated a significant main effect on cooperation behavior. As depicted in Figure 18, the strength of *n* Power negatively predicted how often participants chose to cooperate in the prisoner's dilemma, $B = -0.13$, $SE = 0.05$, $t(48) = -2.49$, $p = .016$. For *n* Affiliation, the main effect failed to reach statistical significance but it was in

the predicted direction, $B = 0.09$, $SE = 0.06$, $t(48) = 1.56$, $p = .12$. The strength of n Affiliation was positively associated with cooperation choices¹².

Figure 17. Plot of the association between n Power (z scores) and cooperation behavior in the prisoner's dilemma.

¹² As in Study 2, we additionally assessed participants' explicit achievement, affiliation, and power motive with the scales *achievement*, *affiliation*, and *dominance* of the PRF (Stumpf et al., 1985) with the aim of contrasting implicit motives and explicit motives in terms of their relevance for the motivational effects of visions. None of the explicit motives, either by itself or in interaction with vision condition or implicit motives, explained any significant portion of variance in the dependent variables.

5.3 Discussion

In sum, these results mostly confirm our hypotheses. Regarding the vision's effects on affective arousal, we found that the affiliation vision indeed promoted hedonic tone, especially in participants high in *n* Affiliation. This implies that visualizing an affiliation vision involves consuming an affectively charged reward. The power vision, in contrast, has no effect on hedonic tone but instead promoted tense arousal and interacts with pre-vision *n* Power to increase energetic arousal. However, the interaction effect of *n* Power x Power Vision on energetic arousal was only present among the male participants. This might imply that men high in *n* Power are more susceptible to the energizing effect of the power vision than women.

The activating effect of the power vision was also apparent in the finding that the power vision increased the alpha-amylase level particularly in participants high in *n* Power. Taking into account that sympathetic activation and the release of stress hormones is associated with a stressed *n* Power (i.e., McClelland, 1989; Jemmott et al., 1983; McClelland, et al., 1980), this finding yields further evidence that the power vision arouses *n* Power. However, as this is the first empirical evidence for the association between implicit power motivation and salivary alpha-amylase, future research will need to replicate this effect.

The analyses of cooperation behavior in the prisoner's dilemma yield evidence that the motivational effects of visions also involve the selection of behavior: As predicted, the power vision indeed lead to increases in exploitive behavior, especially in participants high in *n* Power, whereas the affiliation vision lead to increases in cooperation behavior, especially in participants high in *n* Affiliation (residualized for *n* Power).

Additional analyses revealed that *n* Affiliation and *n* Power were predictive of cooperation behavior: The strength of *n* Affiliation positively predicted cooperation behavior, whereas the strength of *n* Power negatively predicted cooperation behavior. This partly replicates the findings of Terhune (1968) and lends further support to the notion that cooperation represents affiliation-motivated behavior whereas exploitation represents power-motivated behavior.

6 GENERAL DISCUSSION

The aim of the present research was to provide evidence for the motivational effects of visions, and to shed light on the underlying motivational processes. Across three experiments, we tested the propositions that motive-specific visions arouse implicit motives and thereby elicit implicit motivation and facilitate instrumental behavior. This should have been particularly true for participants with a strong implicit motive.

Our findings mostly supported these propositions within the three motive domains and with respect to various motivation indicators (i.e., changes in motive imagery, salivary hormone and enzyme levels, self-reported affective arousal, and behavior). Study 1 and 2 provided replicable evidence that motive-specific visions increase motive imagery in PSE stories. In Study 1, the agency vision led to significant increases in agentic imagery, but not in affiliation imagery, whereas the affiliation vision led to significant increases in affiliation imagery, but not in agentic imagery. In Study 2, participants in the achievement vision condition, but not in the control condition, showed increases in hope for success imagery. However, this was true for all participants, regardless of their implicit motive strength. As discussed in Study 1, the lack of an interaction effect of vision condition and

implicit motives on motive imagery changes may have been due to a ceiling effect exacerbated by characteristics of the PSE coding system.

Moreover, Study 1 and 3 provided physiological evidence that the changes in motive imagery indeed reflect implicit motivation. Study 1 revealed that only in the agency vision condition were increases in power motive imagery accompanied by increases in testosterone, a hormonal indicator of implicit power motivation (e.g., Brown et al, 2009; Schultheiss et al., 2004; Wirth & Schultheiss, 2004). In the affiliation vision condition, changes in affiliation imagery were associated with progesterone changes, a hormonal indicator of implicit affiliation motivation (Schultheiss et al., 2004). In addition, Study 3 revealed that the power vision, but not the affiliation vision, increased salivary alpha-amylase, an enzymatic marker of sympathetic activation, especially in participants high in *n* Power.

We also obtained replicable evidence that the motivating effects of visions are reflected in individuals' subjective affective arousal. Study 2 demonstrated that the achievement vision, but not the neutral vision, led to increased tense arousal. Similarly, in Study 3, the power vision but not the affiliation vision led to increased tense arousal. Effects on tense arousal, however, were not moderated by the participant's pre-vision *n* Achievement or *n* Power. The vision's effects on energetic arousal, in turn, only emerged when considering the strength of the implicit motive: The stronger the implicit motive, the greater the increase in energetic arousal. As energetic arousal, rather than tense arousal, is an indicator of approach motivation and a

precursor of instrumental action, we speculate that it particularly emerges if the agentic vision encounters the corresponding implicit motive. For hedonic tone, analyses revealed an effect of the affiliation vision only (Study 2): The affiliation vision, relative to the power vision, promoted hedonic tone, and this was particularly the case in participants high in *n* Affiliation.

In sum, these findings imply that agentic visions (i.e., visions that furnish achievement or power-related cues) promote a state of activation (i.e., tense and energetic arousal), whereas affiliation visions promote hedonic feelings. In the light of the proposals of the fantasy realization theory, these findings have important implications. According to the theory, positive fantasizing about the future seduces a person to indulge (that is, to mentally enjoy the desired future in the here-and-now) and therefore does not induce the necessity to act (e.g., Oettingen, 1999; Oettingen et al., 2001). We propose that whether a vision promotes indulgence or not depends on the vision's content (affiliation vs. agency) as well as on the match with the individual's implicit motives. The affiliation vision which elicits hedonic experiences should rather bear the peril of indulgence, whereas an agentic vision should promote feelings of tension and energization, especially in individuals high in *n* Agency. This would parallel McClelland's notion that the affiliation motivation reflects the *being*, whereas the power and achievement motivations reflect the *doing* (McClelland, 1986).

Moreover, the moderating effect of the individual's implicit motives might be the reason that positive fantasies have been found to have no

motivational effects (e.g., Oettingen et al. 2001; Oettingen & Mayer, 2002). The power vision, for instance, promoted increases in salivary alpha-amylase, performance, and energetic arousal in participants high in *n* Power or *n* Achievement, but decreases in those low in *n* Power or *n* Achievement. Hence, a data analysis that ignores the interindividual differences in implicit motive strength would have supported the hypothesis that fantasizing about the future fails to motivate. Future research on fantasy realization theory therefore needs to consider the Person x Situation Interaction (Schultheiss, Kordik, Kullmann, Rawolle, & Rösch, 2009), i.e., the fantasy's motive-specific content in the context of the participant's implicit motives.

Finally, Studies 2 and 3 yielded behavioral evidence that implicit motives energize and select instrumental behavior. Study 2 revealed that the achievement vision condition, compared to the no vision condition, led to remarkable increases in performance on the mental concentration task. Participants in the achievement vision condition worked faster and made fewer errors than those in the no vision condition. This was particularly the case in participants high in either hope for success or fear of failure.

Using the prisoner's dilemma paradigm, Study 3 demonstrated the behavior selection effect of implicit motivation. Partly replicating Terhune's (1968) results, we found that *n* Affiliation is associated with cooperative behavior, whereas *n* Power is associated with exploitive behavior. In addition, the experimental motive arousal via visions had an incremental effect on cooperation behavior. As predicted, the power vision promoted exploitive

choices, particularly in participants high in *n* power, whereas the affiliation vision promoted cooperation choices, particularly in participants with a predominant *n* Affiliation.

To summarize, the present research shows that visions are motivationally effective in that they arouse the individual's implicit motives. More specifically, visions increase motive imagery and subjective, motivation-related affect, boost motivated performance and behavior, and lead to increases in motive-specific physiological markers. These results lend support to the notion that the motivational effects of visionary leadership are at least partly based on implicit and non-conscious motivational and affective processes. To initiate these implicit motivational processes it is important that the vision is communicated in a way that it gives rise to mental imagery and, moreover, that the vision contains much motivational incentive value, preferably matching the follower's implicit motives.

6.1 Limitations and future directions

Apart from just proceeding to replicate the findings of the present research in other samples and age ranges, we believe that the following limitations need to be addressed in future research.

The present research examined the motivational effects of personal visions in a lab experiment using visions that were constructed specifically for the purpose of the experiment. As we assumed that the mechanisms in

question are basic motivational processes, we analyzed them on an individual level appropriate for such an experiment. However, future research will need to replicate these findings in the field in order to test their ecological validity.

The findings need to be transferred to organizational contexts using organizational visions and establishing the vision's effect on employee performance or organizational outcomes. Two aspects need to be considered: The vision needs to (1) give rise to mental imagery, and (2) have a motivational incentive value that matches the employees' implicit motives. To examine the relevance of the pictorial quality of the vision, future research needs to compare the motivational effects of organizational visions formulated in a pictorial as opposed to an abstract way. Furthermore, future research will need to analyze organizational visions in terms of their motivational incentive value. As the employees of an organization can differ hugely in terms of their implicit motive profile, it would seem promising to develop multi-thematic visions (cf. Kehr, 2005) that offer incentives for all three motive domains.

Future research also needs to examine real personal visions that individuals pursue in their life, and to predict behavior and performance that is relevant in daily life within a longitudinal design. In this regard, research needs to tie in with findings of fantasy realization theory. Oettingen and her colleagues (e.g., Oettingen & Mayer, 2002, Oettingen et al., 2004) have shown in a series of experiments that overcoming obstacles and sustainably implementing the desired future requires mental contrasting, that is, contrasting the desired future with reality. Pure positive fantasies about the

future had no motivational effects. In the light of these findings, we speculate that imagining the vision elicits implicit motivation. However, the successful implementation of the vision, particularly in the face of obstacles, might additionally require mental contrasting, the development of action plans, and the commitment to and striving for goals. This deserves further exploration in future research.

The present research focused on the implicit motivation system to account for the motivating power of visions. Nonetheless, we additionally assessed explicit motives, none of which explained a significant portion of variance in the non-declarative motivation indicators. The reason might be that we primarily used non-declarative motivation indicators. Future research needs to examine the role of the explicit motive system by testing whether visions interact with explicit motives on declarative measures (e.g., goal choice or self-efficacy expectations).

Moreover, future studies should test whether visions have the capacity to promote the congruence between the implicit and the explicit motive system. Due to their pictorial quality and the resulting access to the implicit motive system, visions should mostly be congruent with the person's implicit motives. Personal goals that are derived from a vision should therefore be more motive-congruent than those that are not derived from visions. Herewith, a personal vision would be a device to promote a person's motivational competence, that is, the ability to align current and future situations with the own implicit motives (Rheinberg, 2006).

In addition, future research needs to empirically support the conceptual distinction between visions and goals. As mentioned above, the crucial characteristic of visions is their representation as mental image. Future studies could therefore compare visions and goals regarding the degree of concreteness and imagery by using content-coding (Bucci & Kabasakalian-McKay, 1992) or computer-based analyses (Mergenthaler & Bucci, 1999).

6.2 Conclusion

The present research provides the first empirical evidence that visions are motivationally effective by arousing implicit motives. More precisely, that a motive-specific vision arouses the targeted implicit motive and thereby facilitates the recruitment and energization of adaptive behavior as well as physiological states that support their execution.

Our hypotheses and findings are based on well-established indicators of implicit motivation including mental content, physiological, affective, and behavioral indicators. The findings complement earlier research on visionary leadership that has yielded beneficial effects of visions, as well as psychological research on the motivational effects of imagery. By bridging these two so far unrelated approaches, the present study underscores the relevance of implicit processes for visionary leadership. It thereby contributes to the understanding of the profound effects of visionary leadership and its underlying motivational mechanisms.

7 ZUSAMMENFASSUNG [SUMMARY]

Visionen sind mentale Bilder von einer erstrebenswerten und erreichbaren Zukunft, die regelmäßig im Gedankenfluss auftauchen. Sie werden von und für Individuen, Gruppen oder Organisationen entwickelt.

Die Entwicklung und überzeugende Kommunikation einer Vision ist eine gemeinsame Kernkomponente der neuen Führungstheorien. Hier wird angenommen, dass eine Vision die Motivation und Performanz der Mitarbeiter steigert. Bisher fehlt es jedoch an empirisch haltbaren Erklärungsmodellen zu den zugrundeliegenden motivationalen Wirkmechanismen. Die vorliegende Dissertation versucht diese Forschungslücke durch einen Brückenschlag zwischen zwei bisher unverbundenen Forschungsfeldern—der angewandten Führungsforschung und der motivationspsychologischen Grundlagenforschung—zu schließen.

Die motivationspsychologische Grundlagenforschung zeigt, dass implizite Motive durch reale oder auch mental simulierte, motivspezifische Bilder angeregt werden können. Visionen sind mentale Bilder. Dementsprechend nehmen wir an, dass der motivspezifische Gehalt einer Vision das entsprechende implizite Motiv anregt und damit instrumentelles Verhalten sowie die physiologischen Zustände, die die Ausführung dieses

Verhaltens unterstützen, fördert. Weiterhin erwarten wir, dass dieser Effekt durch die Stärke der Ausprägung des impliziten Motivs moderiert wird.

Diese Annahmen wurden anhand von drei Laborexperimenten überprüft. Dabei wurde der der motivspezifische Gehalt der Visionen experimentell variiert und die impliziten Motive der Probanden mittels *Picture Story Exercise* (PSE) erhoben. Durch die Imagination einer einem speziellen Motiv zugeordneten Vision wurde das jeweils entsprechende implizite Motiv der Person angeregt. Die Messung der resultierenden impliziten Motivation erfolgte anhand von verschiedenen mentalen, physiologischen, affektiven und behavioralen Motivationsindikatoren.

Experiment 1 integrierte alle drei klassischen Motivbereiche (Affiliation, Macht und Leistung), indem eine agentische (Kombination aus Leistung und Macht) Vision, eine affiliative Vision und eine neutrale Vision (Kontrollbedingung) hinsichtlich ihrer motivationalen Effekte auf die Probanden (N = 65) verglichen wurden. Als Motivationsindikatoren dienten der Anstieg der affiliativen bzw. agentischen Motivationsscores im PSE sowie die hormonellen Korrelate von Affiliations- und Machtmotivation, nämlich Progesteron und Testosteron. Wie vorhergesagt steigerte die affiliative Vision die Menge der affiliationsthematischen Motivationsscores im PSE und die agentische Vision steigerte die agentischen Motivationsscores. Weiterhin ging bei Probanden in der affiliativen Visionsbedingung der Anstieg an affiliationsthematischen Motivationsscores mit einem Progesteronanstieg einher, wohingegen in der agentischen Visionsbedingung der Anstieg der

machtthematischen Motivationsscores mit einem Testosternanstieg einherging.

Experiment 2 fokussierte auf den Bereich der Leistungsmotivation. Die Probanden ($N = 49$) wurden zwei Experimentalbedingungen zugeteilt: leistungsthematische Vision (Entspannungsübung plus leistungsthematische Vision) oder keine Vision (nur Entspannung; Kontrollbedingung). Als Leistungsmotivationsindikatoren dienten der Anstieg an leistungsthematischen Motivationsscores im PSE (Hoffnung auf Erfolg und Furcht vor Misserfolg), des Affekterlebens (Energetisierung und Anspannung) sowie der Performanz (d.h. Reaktionszeit und Fehlerrate) in einem Aufmerksamkeitstest. Wie vorhergesagt steigerte die leistungsthematische Vision die leistungsthematischen Motivationsscores im PSE, die Performanz im Aufmerksamkeitstest sowie die subjektive Anspannung. Die Effekte der leistungsthematischen Vision auf Energetisierung und Reaktionszeit im Aufmerksamkeitstest wurden durch die Ausprägung des impliziten Leistungsmotivs der Probanden moderiert.

Experiment 3 fokussierte auf den Vergleich zwischen affiliations- und machtthematischer Vision. Für diese beiden Motivgruppen wurden jeweils entgegengesetzte Effekte auf folgende Motivationsindikatoren erwartet: das Kooperationsverhalten im Gefangenendilemma, das subjektive Affekterleben sowie das Alpha-Amylase-Level, ein enzymatischer Indikator der sympathischen Aktivierung. Wie vorhergesagt verringerte die

machtthematische Vision das Kooperationsverhalten, wohingegen die affiliationsthematische Vision das Kooperationsverhalten steigerte. Weiterhin steigerte die machtthematische Vision, nicht aber die affiliationsthematische Vision, die Energetisierung, die Anspannung und die Alpha-Amylase-Konzentration im Speichel. Die Effekte auf Energetisierung und Alpha-Amylase waren umso stärker, je höher das implizite Machtmotiv der Probanden ausgeprägt war. Im Gegensatz dazu steigerte die affiliationsthematische Vision, nicht aber die machtthematische Vision, das hedonische Affekterleben.

Zusammenfassend lassen sich unsere Hypothesen weitgehend bestätigen. Drei Experimente, die drei fundamentale Motivationsbereiche und vielfältige Motivationsindikatoren einbeziehen, erbringen Hinweise darauf, dass die motivationale Wirkung von Visionen über die Anregung impliziter Motive vermittelt wird.

Gegenstand zukünftiger Forschung sollte es sein, diese Befunde im Feld mit Unternehmensvisionen und auch mit persönlichen Visionen von Individuen zu replizieren. Weiterhin gilt es, die Bedeutung des expliziten Motivsystems für die motivierende Wirkung von Visionen zu untersuchen sowie Visionen von verwandten Konstrukten, wie etwa persönlichen Zielen, empirisch abzugrenzen.

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9 APPENDIX A—VISION SCRIPTS

Relaxation (Study 1-3)

Sit comfortably in the chair and close your eyes. You don't have to do anything at all now. You can now relax deeply. Focus your attention on your breathing. Just observe your breath, how it breathes inside you. And now imagine that each time you breathe in, you are breathing in relaxation and calm; and each time you breathe out, you are getting rid of all your burdens, breathing them out into the world. Feel completely free and let yourself go. Next time you breathe out, feel how even the smallest muscles under your skin are completely relaxed. Your eyelids are now also feeling very heavy. Feel how your whole face is relaxing now. Your arms are resting heavily on the armrests of the chair. Feel how your arms are getting heavier and heavier. Feel the relaxation right into your fingertips. Feel your whole body lying very heavy and relaxed on the padding of the chair. Your whole body seems to be sinking deeper still into the chair. Your legs and feet are also completely relaxed, right down to your toes, and are lying heavily on the padding of the chair. You are now completely relaxed and focused within yourself. I will now

describe a vision to you, a picture of a future situation. Imagine this picture very intensively and vividly, just like when you are dreaming at night.

Bringing back (administered after each vision in Study 1-3)

Take this picture in your imagination back with you to reality. And you are coming slowly back to this room, back to reality. Now focus your attention on your breathing again and observe whether you are now breathing in and out more deeply. Take a few deep breaths in order to arrive back here completely fresh and alert. You might now feel the need to stretch and yawn. Feel your body on the chair, open your eyes and sit up. Now please return to your seat and continue with the experiment.

Affiliation vision (Study 1)

You have just completed your degree and are at your graduation party. All of your friends and family have travelled from near and far to be there. You are therefore experiencing this day amidst your closest friends and your family. All of them have come to share this moment with you. You look around. Who do you spot? These dear people have supported you on the long journey towards achieving your degree, and now want to celebrate with you. How do you feel now? You now go to the front with your fellow students to be awarded your certificates. To your right and left, you see many people

who are close to you. What do you see in their faces? One student after another receives the certificate. The certificate, a symbol of the time you have spent together. You have studied together for several years, have always stuck together, bolstered each other and experienced a lot together. Through this, a strong feeling of belonging has emerged, real friendships have grown. Everybody is happy to have got there together. What are you experiencing at this moment? The lecturers also join the ceremony. In the last few years, you have got to know some of them well. Then you come down from the stage and are congratulated and embraced by your family and friends. A photographer takes of photograph of you surrounded by your family and your dearest friends. Who can you see in the photo? What do you see in their faces? What is the expression on your face in the picture? How do you come across? You will remember this moment forever.

Agency Vision (Study 1)

You have just successfully completed your degree and are now at your graduation party. You are standing right at the front of the stage. What are you wearing? The dean has called out your name in order to honor you as a successful graduate of your year group. He speaks about your success and your achievements during the degree course and shakes your hand. Take a little time to listen to the dean's words. What is he saying about you? With a nod of acknowledgement, he hands you your certificate and report card. What

feelings do you have at this moment? Take a little time to feel this moment clearly. The rows of people are clapping. Let your eyes sweep through the hall. You see the faces of your family. In their eyes, you can see how proud they are of you. For during your degree, you have grown as a person and have overcome all hurdles with diligence and perseverance. How are you feeling at this moment? You now let your gaze travel further and finally see your professor, who has been a great role model to you in the last few years. He has always set you new challenges and has a large share in your success. He too is applauding and looking at you in acknowledgement. You glance further around the room. All of the attention is focused on you. You are in the thick of the action. A journalist takes a photograph of you with your certificate in your hand. The picture later appears in the university newspaper. What expression is on your face in the picture? How do you come across? How are you holding your certificate? You will remember this moment forever.

Neutral vision (Study 1)

First imagine a white cinema screen, on which your imagination is played like a film. Now slowly let a triangle appear on this screen. Observe the triangle in your imagination very precisely. What shape does it have? Are all of the sides the same length? What color is it? How big is it? Try to envisage the triangle in great detail. Now change the color of the triangle. What color is it now? Observe the new color very precisely. Now let the triangle become slowly

lighter. Then let it become darker again. Now try to turn the triangle in your thoughts, first slowly, and then somewhat quicker. Now stop it again and let it turn in the other direction. Again, first begin very slowly, and then let it become gradually quicker. Stop the triangle again. Let it become more distant again. You are observing how it is getting slowly smaller. Now let it come a little closer again. Observe the triangle in detail very precisely again. In your imagination, travel along the edges of the triangle and again look at its color. Now try to hold this triangle in your imagination, as though you were taking a photograph. Look at it very carefully. What does the triangle look like? How big is it? What color is it? Try to remember this picture.

Achievement vision (Study 2)

You have just successfully completed your degree and are now at your graduation party. You are sitting in a seat in one of the first rows in front of the stage. Today, you will finally receive your degree certificate. The dean opens the ceremony. He speaks about the diligence, the perseverance and the stamina that were necessary in order to successfully complete this demanding degree course. Now take some time to think back over your personal achievements and successes that you have achieved during your degree course. What were your successes? How did you feel when you achieved them? Now the dean calls the graduates one after another to the stage in order to award them their certificates and report cards. Your name is

also called out and you go to the front in order to receive your certificate and report card. You are among the successful graduates of your year group. The dean approaches you with the report card. Before passing you the report card and the certificate, he addresses a few words to you personally. He congratulates you on your outstanding achievements and wishes you great success for your future. Take a little time to listen to the dean's words. What does he say exactly? He then hands you your certificate and your report card and shakes your hand. You are now finally holding your report card in your hand. You take a look at your grades. Compared to the previous year, through a great deal of diligence, you have once again been able to improve your achievements. What are your feelings at this moment? This report card is a good foundation for a very successful career path. With this, you have mastered an important stage of your life and are now looking forward to new challenges. How do you feel now? When you return from the stage with your report card in your hand, you look at the faces of your family. In their eyes, you can see how proud they are of you. During the degree course, you have grown as a person, and with a great deal of diligence and perseverance, you have overcome all hurdles. How do you feel at this moment? A journalist takes a picture of you with your certificate in your hand. What expression do you have on your face in the picture? How do you come across? How are you holding your certificate? You will remember this moment forever.

Affiliation vision (Study 3)

You have just successfully completed your degree and are now at your graduation party. The party is taking place in a beautiful park. In the park, a dance floor and a bar have been set up. There is also a DJ there. All of your friends and family are at this party. You have been looking forward to seeing them all day. You are therefore experiencing this evening amidst your closest friends and your family. The people who were closest to you in the last few years. All of them have come to share this moment with you. You look around. Who do you spot? These dear people have supported you on the long journey towards your degree and now want to celebrate with you. What do you feel now? Your dear fellow students are also all present. To your left and right, you see many familiar people. Which of your fellow students have come? What do you see in their faces? Today's graduation party is to be a symbol of the time you have spent together. You have studied together for several years, always stuck together and bolstered one another. You have experienced a great deal together, and of course you have often partied and laughed together. Through this, a strong feeling of belonging has emerged, real friendships have grown. You are happy to have met these people.

Today's party will strengthen your bond with your fellow students even more. All of your friends are partying wildly. You see some of your fellow students standing at the bar—talking, laughing—while others are dancing wildly on the dance floor. Spending a pleasant evening together—this is the wish that all of

this evening's guests share. How do you experience this moment? Together with your fellow students, you again reflect back on the last few years. You think of the wonderful times you have spent together. Of free periods in the park, the beer garden in the summer, drinking coffee in your favorite café. What are you feeling? Your fellow students have also brought along their family and their closest friends. You are happy to meet them. A photographer takes a picture of you and your best friends. Who can you see on the picture? What do you see in their faces? What expression do you have on your face in the picture? How do you come across? You will remember this moment forever.

Power vision (Study 3)

You have just successfully completed your degree and are now at your graduation party. The party is taking place in a beautiful park. A small dance floor and a bar have been set up in the park. There is also a DJ there. This party is particularly special for you because you have organized it yourself. Without your initiative, this evening's party would not be taking place. As you look around, you realize that many guests have now arrived. You are surprised at how many people have followed up on your invitation. There are even people who have come who might play an important role for your professional career. You take a moment's time and look around. Who do you

see? You are taking centre stage this evening. The many people around you appear to be impressed by the successful party. How do you feel now?

Now the moment has come for you to make your speech. All eyes are on you. Of course, you have prepared your speech well. Take a moment's time to imagine intensively how you make this speech. At the end of a confident speech, you thank all your guests for coming in such great numbers. You also thank the sponsors and the people who actively supported you in organizing the party. Then you raise your glass and toast a successful party. The guests in front of the stage clap. Some people in the first row raise their glass to you. What do you see in their faces? Then the music starts and the people begin to dance. You are still standing on the stage and let your eyes wander across the room. You have managed to impress many people through this party.

How do you experience this moment? You discover that a lecturer whom you had invited has also come. He comes up to you and congratulates you on the successful party. He expresses his admiration that so many people have come to your party. Now you look around again to see if everything is in order. You glance over at the people dancing on the dance floor, past them to the bar, and over to the DJ stand. The DJ nods over to you, signaling to you that everything is going well. You then enter the fray and start dancing.

A photographer takes a photo of you. What expression do you have on your face in the picture? How do you come across? You will remember this moment forever.

Graduation ceremony

Lecture hall

Tutoring lesson