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Creative Capability, Personality, and Innovative Output at the Team Level

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Katharina Haller 의 석사학위논문을 인준함

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Abstract

Creativity and innovation have become crucial factors for the success and survival of any organization. However, despite the wide use of teams for creative tasks and promising potential benefits of teamwork, much about the determinants of team creativity is still unknown. This study advances the understanding of team creativity by analyzing how the team members' creative ability and personality affect innovative team output. Over the course of one semester, 43 teams of undergraduate and MBA students were instructed to generate a new and creative business idea. A mix of objective and subjective measures was used to assess the teams' level of creative ability, extraversion and agreeableness, as well as the innovativeness of their final output. Results show that agreeableness positively moderates the relationship between creative ability and innovative output. This finding highlights the important role that the social context plays in teamwork. Moreover, it shows that certain factors can have a strikingly different, or even the opposite effect on the team level than they do on the individual level.

Keywords: Creativity, innovation, team, personality, creative ability, agreeableness, extraversion

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Table of Contents

Introduction

In a globalizing, fast changing world creativity and innovation have become vital for any organization's success and survival (De Stobbeleir et al., 2011; Gupta et al., 2016; Madjar et al., 2011). But how can innovative performance be maximized? Over the past few decades a great amount of research has built up in an attempt to answer this critical question (Anderson et al., 2014; Kaufman and Sternberg, 2010). However, most of this research has focused on an individual level and ignored that people in organizations rarely generate ideas in isolation (Garfield et al., 2001; Macht and Nembhard 2015). In fact, in the hope of tapping into a wider pool of knowledge and perspectives, more and more organizations are resorting to work teams for creative tasks (Drach-Zahavy and Somech, 2001; Hoever et al., 2012; Kristof-Brown et al., 2015; Paulus, 2000). The present research thus aims to bridge between individual and the team level research by analyzing how individual factors of team members influence a team's innovative output. Or more specifically, how do creative ability and personality affect innovative output in the social context of teamwork?

As Tagger (2002) has pointed out, little is still known about the factors that determine a team's ability to effectively use individual creative resources. Most studies have focused on the individual level (Shalley et al., 2004) and team level processes are yet the least developed part of the organizational creativity literature (Bissola and Imperatori, 2011; Kutzberg and Amabile, 2001). Even multi-level frameworks tend to neglect to explain how individual components affect collective creativity (Bissola and Imperatori, 2011). However, teams are not only widely used

in modern organizations, research has also shown that teams promote creative synergies and can thus produce results that exceed those that the members could have created on their own (Baer et al., 2008; Kutzberg and Amabile, 2001; Taggar, 2001). In order to actually realize the huge potential benefits of team work it is essential to understand how creativity works on a team level.

Two individual factors that have continuously been found to play a crucial role in creative work are creative ability and personality (Kaufman and Sternberg, 2010; King et al., 1996; Woodman et al., 1993). Quite surprisingly, though, there has been barely any research on how these factors are interrelated. As personality determines a person's social behavior, and social behavior in turn affects a group's ability to use individual creative resources (Madjar et al., 2002; Raja and Johns, 2010; Taggar, 2002) there is, indeed, much reason to assume that personality functions as an important moderator in creative team processes. However, as team work requires different strengths and holds different challenges from individual work (Taggar, 2001; Woodman et al., 1993) it can be expected to function quite differently on these two levels. In fact, the traits extraversion and agreeableness might even exert an effect opposite to that found on an individual level. The present research aims to clarify this important point by analyzing how the personality of team members moderates the relationship between creative ability and innovative outcome.

To do so, participants were assigned to small teams and instructed to create a new business idea over the course of one semester. Each team's final output was rated according to its innovativeness and self-assessments were used to determine the team members' personality. The teams' mean creative ability, however, was

assessed through objective methods. Thereby, the study responds to recent findings (Park et al., 2016) that have shown that subjective evaluations, such as self-reports, tend to produce biased results. Especially in social settings, illusory superiority, leniency biases and social desirability can lead individuals to rate themselves much more positively, than objective evaluations would. As prior studies have mostly resorted to subjective evaluation measures, such as self-, supervisor, or peer evaluations, the present research takes an important step in enhancing the robustness of results by employing objective methods to assessed both divergent and convergent thinking.

Analyses show that agreeableness does indeed take a different effect on the team level than it does on the individual level. The present study, thus, makes a meaningful contribution to the creativity literature by advancing the understanding of team creativity and highlighting the important role the social context plays in teamwork.

Theory and Hypotheses

Literature review

Over the past 30 to 40 years, practitioners as well as theorists have shown increasing interest in organizational creativity and innovation. Consequently, a substantial research literature has built up that aims to understand how creative processes work and how idea generation can be facilitated and maximized (Anderson et al., 2014; Kaufman and Sternberg, 2010). In this literature, creativity

is most commonly defined as "the production of novel and useful ideas by an individual or […] group of individuals working together" (Amabile, 1988, p. 126). Recently, however, researchers have pointed out that creativity is not only an outcome but also a process. For a full understanding of creativity it is thus important to also consider "the journey toward possibly producing creative outcomes or improving overall performance through the engagement in creative acts, regardless of whether the resultant outcomes are novel, useful or creative" (Gilson and Shalley, 2004, p. 454).

Research has shown that employee creativity can greatly contribute to organizational innovation, effectiveness and survival (De Stobbeleir et al., 2011; Shalley et al., 2004), ranging from minor adaptions to radical breakthroughs (Madjar et al., 2011). In fact, creativity can be seen as a first step in the innovation process. While creativity means the generation of novel and original ideas, innovation refers to their implementation (Gupta and Banerjee, 2016). As such, creative processes ultimately result in innovative output.

Creativity has been analyzed on three different levels: the individual level, the team level, and the organizational level. There have also been some attempts to combine these different approaches in multi-level analyses (Anderson et al., 2014; Woodman et al., 1993). Despite the growing importance of teams in modern organizations (Drach-Zahavy and Somech, 2001; Kristof-Brown et al., 2015), most research has focused on the individual level (Shalley et al., 2004). In fact, research on the team level is still the least developed area in the organizational creativity literature (Bissola and Imperatori, 2011). As a result, more and more authors have called for the need to examine the factors that determine creativity on a team level

and provide an understanding of how collective creative processes work (Anderson et al., 2014; Kutzberg and Amabile, 2001; Macht and Nembhard, 2015).

Identifying the antecedents of creativity has been a major aim of creativity research (Anderson et al., 2014; De Stobbeleir et al., 2011; Gupta and Banerjee, 2016). According to the interactionist perspective, creativity is a complex product of a person's behavior in a given situation (Woodman et al., 1993). This means that various personal and contextual factors work together to influence the creative process and outcome. Specifically, creativity research has addressed four different areas: cognitive processes, the creative personality, behavioral elements, and environmental factors (Kutzberg and Amabile, 2001). While there has been much progress in identifying potential antecedents, studies have yielded divergent results on their effects on creativity (Anderson et al., 2014; Hülsheger et al., 2009). Moreover, much about their interplay and their effects on different levels, especially on collective ones, is still unknown (Bissola and Imperatori, 2011; Macht and Nembhard, 2015).

Creative ability

Authors have noted that there are certain cognitive skills that promote creative idea generation and thereby greatly determine someone's innovative performance (Taggar, 2001) – or in other words, that "[…] some people are simply more creative than others" (Garfield et al., 2001, p. 322). Guilford (1950) was the first to specify distinct constructs that define individual creative thinking. He defined fluency, flexibility, novelty, synthesis, analysis, reorganization and redefinition,

complexity, and elaboration as important skills for creative thinking. He states that while everyone possesses these skills to a certain extent, very creative people simply have "more of what all of us have". Building on this argument, Amabile (1988) identified creativity-relevant skills as one of three major components of individual creativity. Her definition of creative skills takes a broader view and includes a cognitive style favorable to taking new perspectives on problems, the application of heuristics to explore new pathways, a working style conductive to the persistent, energetic pursuit of one's work, and personal qualities, such as risk orientation and social skills.

Much research has built on these definitions and creative ability has been shown to be a major determinant of innovative performance – not only on an individual but also on a collective level (Choi et al., 2009; King et al., 1996; Kutzberg and Amabile, 2001; Taggar, 2001). Taggar (2001) demonstrated that teams whose members have a high level of creative ability can produce more innovative output than teams whose members have a lower level of creative ability. Despite this big importance of creative ability, research has also shown that team creativity is not only a cognitive but also a social process (Garfield et al., 2001).

Team dynamics

Teams constitute a social setting (Taggar, 2002) in which a small group of members collaborate on a common task (Hoegl and Gemuenden, 2001) and thereby influence each other through their interactions (Paulus, 2000). An often used model for team settings is the input-process-output model (Barrick et al., 1998). It

proposes that a variety of inputs – individual, team level, and environmental ones – jointly influence intragroup processes, which in turn affect a team's output. As such, team creativity can be seen as a function of various factors (Woodman et al., 1993). What greatly distinguishes team creativity from individual creativity are the social processes that are involved in interactions. By sharing their ideas, providing feedback, discussing, and arguing, team members substantially influence each other's thinking and behavior (Barrick et al., 1998; Madjar et al., 2011).

As a consequence, group problem solving holds both potential risks as well as potential benefits (Kutzberg and Amabile, 2001). While some authors say that team creativity could be explained by aggregating individual creativity (Pirola-Merlo and Mann, 2004) the majority of researchers agree that group creativity is more than the "simple sum" of individual creative skills (Baer et al., 2008; Bissola and Imperatori, 2011; Woodman et al., 1993). By stimulating each other's thinking and building on each other's ideas group members can achieve creative synergies that enable them to produce superior ideas – ideas that the members could not have generated on their own (Baer et al., 2008; Taggar, 2001). This means that groups have the potential to substantially elevate their members' creative potential, but on the other hand, they might also hamper it.

According to the theory of reasoned action, not all ideas that are generated by the group members are actually contributed (Garfield et al., 2001). Groups often evaluate ideas as they are shared (Paulus, 2000). These evaluations, together with group norms and a member's perception of the idea itself, can lead to the phenomenon of evaluation apprehension: a team member's unwillingness to state some of his ideas due to the fear of being negatively evaluated (Taggar, 2001).

However, sharing and building on each other's ideas is vital for a group's innovative performance (Gilson and Shalley, 2004; Kutzberg and Amabile, 2001; Richter et al., 2012). In fact, one of the very reasons for the use of teams is the integration of diverse perspectives, knowledge, experiences and opinions (Drach-Zahavy and Somech, 2001; Hoegl and Gemuenden, 2001).

The theory of cognitive stimulation, proposes that sharing novel ideas can trigger valuable avenues of thought that group member's might otherwise not have pursued (Taggar, 2001). As associations tend to follow the rule of similarity individuals usually think within certain categories. However, if a team member brings up a new idea or category he can stimulate the other members to think into new directions and use categories of thought that they would not have come up with on their own (Paulus, 2000). This way, the exposure to other members' creative ideas can strongly enhance a team's idea generation, and ultimately its innovative output (Garfield et al., 2001; Gupta and Banerjee, 2016).

As it can be seen, team dynamics play a critical role in elevating but also hampering individual creative ability (Pirola-Merlo and Mann, 2004; Shalley et al., 2004; Taggar, 2001; Taggar, 2002). Therefore, well-functioning team dynamics are crucial for achieving team synergies and reaping the potential benefits of creative teamwork. However, if that is the case, the inevitable next question then is, what determines the functioning of group dynamics? The present research aims to provide an answer to this question by analyzing how the team members' personality traits affect social dynamics and thereby influence how well a team can make use of its members' creative ability.

Personality

As personality strongly affects how individuals behave in various situations (Madjar et al., 2002) and how they respond to certain tasks (Kristof-Brown et al., 2005) it has long been considered as a possible determinant of creativity (De Stobbeleir et al., 2011; Kaufman and Sternberg, 2010). However, at first, there was little consensus among creativity researchers about how personality should be defined and measured (Neumann et al., 1999). This led to a "maze of inconsistent results" (Driskell et al., 1988, p. 94) that were hard to compare and organize. Only the introduction of the Five-factor model of personality finally allowed for consistency among research efforts (Taggar, 2002) and provided a framework that convincingly organized the magnitude of personality traits (Neumann et al., 1999). Today the Five-factor model, or so-called "Big Five", is the most used personality framework in creativity research (Baer et al., 2008; Sung and Choi, 2009). It divides personality in five broad categories: conscientiousness, extraversion, openness to experience, agreeableness, and neuroticism (King et al., 1996).

A number of studies have analyzed how these five personality traits are linked to individual creativity. While the relation between personality and creativity is complex (Anderson et al., 2014), research suggests, that certain personality traits have a positive or negative effect on innovative output. King et al. (1996) found that openness of experience and extraversion were correlated with creative ability and positively influenced creative accomplishments. Also Sung and Choi (2009) reported a positive effect on creativity for these two traits. Agreeableness, on the other hand, was found to be negatively correlated with creative accomplishments

on the individual level King et al. (1996). Studies on conscientiousness and neuroticism have shed less consistent results.

There have also been approaches that examined how personality interacts with several individual and contextual factors. For example, it has been linked to creative ability (King et al., 1996), motivation (Sung and Choi, 2009), creative confidence (Baer et al., 2008), creative self-beliefs (Karwowski et al., 2016), and job scope (Raja and Jones, 2010). However, most of these studies have focused on the individual level. Thus, only little is known about how personality interacts with other variables to influence innovative output on the team level.

Nonetheless, there is strong reason to assume that personality plays an important moderating role in group contexts. Research has shown that personality substantially affects how individuals deal with contextual factors and how they behave in social settings (Madjar et al., 2002). This means that personality has a big impact on how people respond to a certain task and a certain team (Kristof-Brown et al., 2005). It also determines how team members interact, both cognitively and interpersonally (Kutzberg and Amabile, 2001). As such, personality plays a crucial role in team processes (Barry and Stewart, 1997) and affects how a team functions and performs (Baer et al., 2008; Neumann et al., 1999).

Out of the Big Five, two factors have been found to be particularly relevant to social behavior: extraversion and agreeableness (Barry and Stewart, 1997; Cuperman and Ickes, 2009; Kristof-Brown et al., 2005; Morgeson et al., 2005). As social behavior is highly important for all phases of creative team work (Paulus,

2000) extraversion and agreeableness can be expected to function as important moderators on the team level. Pirola-Merlo and Mann (2004, p. 239) pointed out that "Individual creativity can provide the raw material of novel and useful ideas, but […] team member interactions and team processes play an important role in determining how this raw material is developed into group-level creativity." Accordingly, extraversion and agreeableness might moderate how much use a team can make of its members' creative ability. Moreover, they might have an entirely different effect in the social context of teamwork than they have on an individual level.

Extraversion

Extraversion is a personality trait that is interpersonal in its nature and strongly related to the quality of social interactions (Barry and Stewart, 1997). Extraverts are described as active and passionate, they have a high level of self-confidence, and are willing to take risks (King et al., 1996). Consequently, extraverts tend to actively engage with others and take the lead in conversations (Cuperman and Ickes, 2009). On an individual level, extraversion has been shown to positively affect creative performance (Karwowski et al., 2016; Sung and Choi, 2009) and King et al. (1996) found that it also positively correlates with creative ability. However, research suggests that in teams a high level of extraversion among members could have the potential to create problems. Barry and Stewart (1997) found a curvilinear relation between the proportion of extraverted team members and team performance. Also Neumann et al. (1999) argue that teams that are

homogeneous in extraversion may perform ineffectively. This gives rise to the assumption that a high level of extraversion among team members might hamper important team processes and thereby prevent teams from fully making use of their members' creative ability.

While extraverts are very active in engaging with others, they are also very dominant (Kristof-Brown et al., 2005). They tend to take the lead in conversations and put their partners into rather passive roles. Cuperman and Ickes (2009) found that the more extraverted the partner was, the less likely a person was to take an active role in the conversation. Instead of voicing their own ideas, people with a very extraverted partner simply provided verbal acknowledgements to keep the conversation going. Such an interaction style, however, creates a strong imbalance in contributions and impedes the cross-fertilization of creative ideas between team members.

Extraverts tend to have a high need to verbalize their ideas and thoughts – for some people, so-called "talkaholics", this need can even be excessive (Macht and Nembhard, 2015). Some extraverts might needlessly elaborate on their ideas or tell stories related to them. This can lead to the problem of production blocking: when other members are talking it is impossible to share one's own ideas and opinions (Kutzberg and Amabile, 2001; Paulus, 2000). Some thoughts might be lost while waiting and others might be put off as no longer relevant to the conversation. In addition, concentrating on the ideas and stories of others occupies cognitive resources (Paulus, 2000). Having to generate one's own ideas while attending to those of others at the same time can thus make it very hard if not impossible for individuals to use their full creative potential.

Another problem that a high level of extraversion among team members entails is the struggle for leadership. Extraverts have been found to be good leaders but not good followers (Smelser, 1961). This can lead to conflicts between members (Barry and Stewart, 1997) and divergent views about who is supposed to do what. As a result, the coordination of tasks and roles as well as a high level of creative performance can be difficult if not impossible to achieve (Kutzberg and Amabile, 2001). Research has shown that the role of leader also requires the complementary role of follower (Smelser, 1961). Teams function much better when there is a complementarity of dominance and submissiveness among members - that is, when there is heterogeneity in extraversion (Kristof-Brown et al., 2005). In fact, Kristof-Brown et al. (2005) reported that a good balance between leaders and followers leads to more inventive solutions, greater satisfaction with the team, and thus, greater individual contributions and an overall better team performance.

Moreover, since extraverts are very ambitious (Berry and Stewart, 1997; Hogan and Holland, 2003) a high level of extraversion among team members can create a climate of competition (Morgeson et al., 2005). Research has shown that competitive behaviors evoke distrust and frustration and can lead members to withhold information (Hoegl and Gemuenden, 2001). They can also cause conflict between team members. The literature differentiates between task conflict and relationship conflict. While task conflict refers to "disagreements among team members about the content of the tasks being performed, including differences in viewpoints, ideas, and opinions" (Jehn, 1995, p. 258) relationship conflict describes social-emotional conflicts arising from interpersonal disagreements (Jehn, 1995). Findings show that a moderate amount of task conflict can be conductive to

innovation as it triggers information exchange and the exploration of opposing opinions, and thereby fosters new ideas (Tjosvold, 1985; West, 2002). Relationship conflict, on the other hand, has been found to narrow the range of attention, produce rigid thinking, and reduce cognitive complexity (Carnevale and Probst, 1998). Moreover, anger and frustration can impede effective communication and reduce the members' receptiveness to each other's ideas, which results in highly dysfunctional team dynamics (Jehn, 1995; Pelled, 1996). Kutzberg and Amabile (2001) point out that conflicts are highly volatile. Even more productive task-based conflicts can quickly escalate and turn from a minor disagreement into an unmanageable and destructive event.

Considering the above mentioned arguments, a high level of team extraversion seems to be a force that rather drives team members apart instead of bringing them together. It keeps members from sharing their thoughts and ideas with each other and evokes competition and conflicts that undermine team functioning. Under such circumstances it is unlikely if not impossible for teams to utilize their members' full potential of creative ability, let alone generate creative synergies. Thus, it is proposed that

H1: On a team level, extraversion negatively moderates the relationship between creative ability and innovative output.

Agreeableness

Agreeableness is the second trait, out of the Big Five, that has been found to play a crucial role in social interactions. Agreeable people can be described as friendly,

warm, trusting, tolerant, and helpful (Barrick et al., 1998). They are good-natured and have a strong desire for harmony (Sung and Choi, 2009) as well as an eagerness to cooperate and avoid conflict (King et al., 1996). However, this strong desire for interpersonal harmony can make it difficult for agreeable people to create and express ideas that deviate from the norm (Sung and Choi, 2009). Consistent with this argument, King et al. (1996) found a negative relationship between agreeableness and individual creative accomplishments.

So far, few studies have analyzed agreeableness on a team level. However, those which have suggest that the effects might be very different from those found on the individual level (Taggar, 2002). In fact, the very factors that have been shown to potentially hamper creativity when working on one's own can become vital in the social context of teamwork.

Barrick et al. (1998) state that "the very essence of agreeableness is cooperation." While this might make people less revolutionary on an individual level, it can greatly contribute to social interactions on a team level. As Morgeson et al. (2005) point out, collaboration and joint action are indispensable for teamwork. Agreeable members tend to be good at communicating with others (Thoms et al., 1996) and to have excellent interpersonal skills (Taggar, 2002). Cuperman and Ickes (2009) found that agreeable people actively involve their vis-à-vis is the conversation. The more agreeable the partner was, the more behaviorally involved the person tended to be. Moreover, people reported that they felt comfortable and enjoyed the interaction. Creating a climate that makes members comfortable in taking risks and openly exchanging their ideas can greatly enhance team dynamics (Gilson and Shalley, 2004).

17

As Madjar et al. (2011) explain, new ideas challenge the status quo and disturb power balances. Hence, they are generally perceived as risky. Especially in regard to the above described problem of evaluation apprehension a high level of agreeableness can thus be very beneficial. After conceptualizing an idea individuals actively choose whether to share it with their team members or not (Gilson and Shalley, 2004). While a competitive climate and negative evaluations are likely to lead members to withhold their ideas (Hoegl and Gemuenden, 2001; Paulus, 2000), an environment that is cooperative, comfortable and psychologically unthreatening can promote the sharing of diverse creative inputs. Psychological safety can be defined as a "shared belief that the team is safe for interpersonal risk taking" (Burke et al., 2006, p. 1194) and is characterized by mutual respect and trust. It facilitates the expression of minority views and allows for opposing opinions, which can be especially beneficial when creating original new solutions (Drach-Zahavy and Somech, 2001).

However, idea sharing is only likely to stimulate new associations and team synergies when members actively attend to and value the ideas and comments that others contribute to the discussion (Baer et al., 2008; Paulus, 2000). Also in this aspect agreeableness plays a crucial role: It encourages the consideration and recognition of other members' ideas (Taggar, 2002). A "key resource" for creativity is the information provided by others (De Stobbeleir et al., 2011; Richter et al., 2012). If team members share and attend to each other's ideas the team's knowledge base can be substantially extended (Hoever et al., 2012; Kutzberg and Amabile, 2001; Taggar, 2002). De Stobbeleir et al. (2011) found that feedback can provide differing perspectives and enable members to make new creative links.

Moreover, idea sharing has been found to stimulate cognitive flexibility (Hoever et al., 2012), trigger new associations (Kutzberg and Amabile, 2001; Paulus, 2000), and enhance creative synergies (Richter et al., 2012).

Agreeableness has also been found to increase team cohesion (Barrick et al., 1998). Cohesion refers to a sense of belonging and a desire to keep the team going (Hoegl and Gemuenden, 2001) and has emerged as an important determinant of creativity (Gupta and Banerjee, 2016; Hülsheger et al., 2009). Since agreeable team members are very likable and pleasant to work with (Cuperman and Ickes, 2009) a high level of agreeableness leads to more interpersonal attraction between team members, and thus, more social cohesion (Morgeson et al., 2005). The level of cohesion, in turn, is linked to synergistic interactions, positive communication and effective conflict resolution (Barrick et al., 1998).

All these factors can leverage the creative ability of a team's members. A high level of agreeableness encourages members to actively exchange opinions and build on each other's creative ideas. This in turn, promotes creative synergies and enables teams to create an innovative output that is likely to exceed what any member could have created on his own. Thus it is proposed that

H2: On a team level, agreeableness positively moderates the relationship between creative ability and innovative output.

Method

Sample and procedure

The participants of this study were undergraduate and MBA students who were enrolled in courses on "Design thinking and innovation" and "Creativity and innovation" at a Korean university between 2011 and 2016. At the beginning of the semester the participants were randomly assigned to teams of 3-6 people. Over the course of the semester each team developed a new business idea which was constantly upgraded and presented at the end of the term. During the whole project participants remained in the same team. The business idea had to be a new product or service that was not yet on the market. While working on the project for one semester the team members exchanged various ideas and constantly interacted to improve their concept's novelty and usefulness. At the end of the term each team set up a presentation booth to introduce and explain its business idea.

Team creative capability

Research on the relationship between team member creativity and team level creativity has mainly relied on subjective methods of data collection: self-reports by the individual team members (e.g. Somech and Drach-Zahavy, 2011), reports of colleagues (e.g. Taggar, 2002), and evaluations by the team leader (e.g. Gong, Kim, Lee, and Zhu, 2013).

However, Park et al. (2016) who compared subjective and objective evaluations of creativity found that subjective methods tend to yield better results, i.e. a higher mean, than objective methods. This is because illusory superiority, leniency biases and social desirability may lead individuals to rate themselves more favorably in social settings. These biased ratings, however, can distort the analyzed effects. The present research responded to this finding by employing objective evaluation methods to measure the teams' creativity more correctly. Objective tests that took about 120 minutes were used to assess the team members' creative thinking ability.

To measure team creative capability, the study used a two-step approach, measuring individual ability of all team members and averaging individual scores for each team. First, all team members in this study completed a voluntary 2-hour paper-based test. For this assessment iCreate, a creativity aptitude test developed by a research institute in Korea (Park et al. 2016), was used. It measures individual ability in terms of creative problem solving, more specifically, divergent and convergent thinking abilities. The test uses a total of 45 questions in verbal, figural, mathematic, and artistic forms.

Divergent thinking is a good predictor of creative potential and achievement and requires the ability to make unique combinations of ideas, come up with remote associations, and transform ideas into unusual forms (e.g., Basadur et al. 1986; Guilford, 1967; Torrance, 1962; Woodman et al., 1993; Cropley, 2006; Mednick, 1962; Wallach and Kogan, 1965). Participants in this study were asked to answer 30 questions within 50 min, with an average time of 100 seconds for each question. To complete the test, participants were asked to produce multiple or alternative

answers from given information or situations that were described in verbal, figural, mathematic, and artistic forms.

Previous research also recognized convergent thinking ability as a critical determinant of individual creativity (Cropley and Cropley, 2012; Cropley, 2006; Runco, 2004). Convergent thinking ability was assessed through 15 multi-choice questions completed within 30 minutes, with an average time of 120 seconds per question. The questions included verbal, figural, and mathematic tasks, and participants were asked to select a single answer for most questions. This required qualities such as speed, accuracy, and logic.

All answers from participants were coded for the analysis by two research assistants relying on the coding manual developed by the research institute. They were trained and retrained through multiple pilot tests and coding exercises for over 3 months. Cronbach α for the interrater reliabilities across items and participants ranged from .86 to .97. Once all coding procedures were completed, pre-developed computer algorithms automatically calculated individual creativity scores. Overall, the individual creativity score consisted of the sum of divergent and convergent thinking scores. It was calculated as a single index that ranged from 0 to 100. Following the previous arguments, divergent and convergent thinking ability scores were given equal weight to calculate the objective assessment score. To arrive at a measure for team creative ability the team members' individual creativity scores were summed up and averaged. This way a mean creative score for each team could be calculated.

Agreeableness and extraversion

Team members' agreeableness and extraversion were measured with items from Goldberg's (1999) Big Five Inventory. Both scales contain five items and utilize a five-point Likert scale ranging from 1 ("not at all descriptive of me") to 5 ("very descriptive of me"). Goldberg (1999) reported average scale reliabilities between .75 and .85 and high correlations with other known measures of the five-factor model. It was decided to use the BFI rather than the NEO-PI scales simply because of time constraints. Subjects had already completed the BFI included in the above individual creativity test packet and so this measure was readily available. However, the BFI has shown high convergence with the NEO-PI scales and high self-peer convergence. Correlations between self and aggregated peer ratings on the five scales range from .56 for agreeableness to .68 for extraversion (King et al., 1996). To measure creativity at the team level individual scores of each team's members were summed up and averaged.

Team innovative output

The ideas presented by each team (details on the idea development procedure can be found in the section above, "Sample and Procedure") were evaluated by the professor and two teaching assistants (enrolled in PhD programs). Each rater worked independently and evaluated the ideas on the base of three sub-criteria: technological enhancement, market size, and inimitability. The three evaluations were averaged to calculate a score for each team. Teams could receive a maximum of 10 points.

Control variables

The study controlled for the number and team members and the team members' age. Prior research has shown that larger teams could have an advantage in the completion of difficult tasks in uncertain, complex environments (Hülsheger et al., 2009; Stewart, 2006). This is because having more members might provide a team with a wider array of diverse viewpoints, skills, and perspectives (Burke et al., 2006; Paulus, 2000). As Hülsheger et al. (2009) point out, also the generation and implementation of creative ideas is an ill-defined, complex task. Thus, team size could positively affect creative outcomes. Studies on brainstorming provide further support for this assumption by showing that both the number and quality of creative ideas increases with group size (Bouchard and Hare, 1970; Gallupe et al., 1992).

Moreover, there is substantial evidence that the team members' age can play an important role in team performance. Vroom and Pahl (1971) showed that age is negatively related to risk-taking. In addition, age has been found to influence cognitive processes (Datan et al., 1987), attitudes and values (e.g. Elder, 1975, Thernstorm, 1973). Therefore, age differences could lead to conflict between team members and greatly impact a team's overall performance. As such factors could distort the effects analyzed in the present study, team size and age were added as control variables.

Results

Table 1 shows the descriptive statistics and correlation matrix of the variables used in this study. A total of 43 teams was included in the statistical analysis, with an average team size of 4.07 members and a standard deviation of 0.51. In general, teams consisted of between 3 and 6 participants. The teams' average creative ability amounted to 774.75, with a standard deviation of 41.81.

For innovative performance, which functioned as dependent variable in this study, the average was measured at 7.59 (standard deviation of 1.64). The team with the best performance received 10 points, while the lowest score was 4points.

Table 1: Means, standard deviations, and correlations for all variables

Variables	Mean	s.d.	1	2	3	4	5
1. Performance	7.59	1.64					
2. Average creativity	774.75	41.81	0.63				
3. Extraversion	57.61	14.21	0.40	0.22			
4. Agreeableness	53.14	14.09	0.39	0.27	0.47		
5. Group size	4.07	.51	-0.19	-0.31	0.23	-0.02	
6. Age	25.22	4.38	-0.62	-0.65	-0.28	-0.27	0.34

To test the proposed hypotheses regression analysis was used. The results of this analysis can be found in table 2. Model 1 only included the team members' creativity score and the control variables team size and age. It demonstrated that the relationship between creative ability and innovative output is positive and significant. In model 2, the team members' level of extraversion and agreeableness were included and it was analyzed how these two personality factors affect innovative team output. For both variables the results show a positive relation to

innovative output. To test hypothesis 1 and 2, model 3 additionally included interaction teams for creative ability and the two personality factors. While it was predicted that extraversion would positively moderate the relationship between creative ability and innovative output, the statistical analysis did not show any significant results. However, for agreeableness a significant, positive moderation effect could be found. Thus, hypothesis 2 could be confirmed.

Table 2: Results of regression analyses for team performance

Variable	Model 1	Model 2	Model 3
Average creativity	.022 (.005)***	.016 (.005)***	.016 (.005)***
Extraversion		.038 (.015)**	.049 (.016)***
Agreeableness		.026 (.013)**	.019 (.013)
Creativity X Extraversion			.00063 (.00044)
Creativity X Agreeableness			.00067 (.00036)*
Group size	-.157 (.407)	-.525 (.361)	-.789 (.386)**
Age	-.048 (.055)	-.023 (.047)	-.029 (047)
N	43	43	43

* $p < .10$, two-tailed test
** $p < .05$, two-tailed test
*** $p < 0.01$, two-tailed test

Discussion

The purpose of this study was to further understand how personal characteristics of team members affect a team's innovative performance. As teams offer a wide pool of knowledge and different perspectives, more and more organizations are resorting to work teams for creative tasks (Drach-Zahavy and Somech, 2001; Hoever et al., 2012; Kristof-Brown et al., 2015; Paulus, 2000). However, little is still known about the factors that determine a team's ability to effectively use individual creative resources (Tagger, 2002). The present study, thus, makes a valuable contribution to the literature on team creativity by analyzing how the team members' personality moderates the relationship between creative ability and a team's innovative outcome.

Consistent with previous studies (Guilford, 1950; King et al., 1996; Taggar, 2001; Woodman et al., 1993) creative ability was found to exhibit a positive effect on innovative output. Groups whose members had a higher mean level of creative ability performed significantly better than those with a lower level of creative ability. This is because members who are very flexible in their thinking (Guilford, 1950) and good at taking different perspectives (Amabile, 1988) can create more diverse and unique associations. These associations are turned into creative ideas and can ultimately result in highly unique innovations.

Personality functioned, as expected, as a moderator between creative ability and innovative output. This means that the team members' personality affected how well a team could make use of its members' creative ability. However, the effect

personality exhibited in the social context of team work was partly different from that found on the individual level.

While agreeableness can lead to conformity and thereby negatively affect creativity on an individual level (King et al., 1996; Sung and Choi, 2009), the present research found that agreeableness has a significantly positive effect on the team level: It positively moderates the relationship between creative ability and a team's innovative output and thereby elevates the team members' creative potential. The striking difference between these results suggests that the demands and challenges of teamwork differ greatly from those of individual work. As teams constitute a social context, interactions and group dynamics have a big impact on their creative performance.

Research has shown that a high level of agreeableness among team members increases cooperation (Barrick et al., 1998; Morgeson et al.; 2005), strengthens team cohesion (Barrick et al., 1998; Hoegl and Gemuenden, 2001; Morgeson et al., 2005), promotes the exchange of ideas and information (Gilson and Shalley, 2004; Paulus, 2000), and encourages members to actively attend to and build on each other's inputs (Baer et al., 2008; Paulus, 2000; Taggar, 2002). This way, team members become fully engaged in the creative process and synergies are likely to emerge. The high level of involvement and cooperation enables teams to leverage their members' creative skills and to generate highly innovative output. Agreeableness, thus, functions as a positive moderator on the team level.

For extraversion, however, the expected negative effect could not be observed in this study. As extraversion has been associated with dominance (Kristof-Brown et

al., 2005), unbalanced communication (Cuperman and Ickes, 2009¸Kutzberg and Amabile, 2001; Paulus, 2000), competition and conflict (Hoegl and Gemuenden, 2001; Morgeson et al., 2005), and leadership struggles (Barry and Stewart, 1997; Smelser, 1961) it was proposed that extraversion would negatively moderate the relationship between creative ability and a team's innovative output. However, this effect could not be found in the present study. Instead results showed a slight positive interaction between extraversion and creative ability. There are two possible explanations for this observation:

First, it is possible that the setting of the study prevented the negative aspects of extraversion from truly taking effect. While the predictions were made for organizational creativity, the participants of this study were students who developed creative business ideas for a class project. However, the classroom setting might lead to different behaviors and group dynamics than an actual work environment. As there is less at stake conflicts and leadership struggles might be reduced. Moreover, since group projects sometimes entice students to social loafing and free-riding, having members who are actively involved in the task might by itself already be a big advantage.

A second explanation could be that the positive sides of extraversion outweigh the negative ones. While it is true that a high level of extraversion can cause various problems, extraversion has also been shown to have positive effects on creativity. Research that analyzed extraversion on the individual level stresses that extraverts are active, passionate, confident, and willing to take risks (King et al., 1996; Sung and Choi, 2009). Self-efficacy has been found to be important for creative team performance (Lim and Choi, 2009; Richter et al., 2012; Thoms et al., 1996). Also a

willingness to take risks and proactive behavior in terms of idea sharing, feedback seeking and expressing opposing views can be highly beneficial for teams (Baer et al., 2008; Gilson and Shalley, 2004; Madjar et al., 2011). Moreover, it has been suggested that their social confidence and social prowess facilitate the organization and coordination of team tasks (Taggar, 2002), and activate others in discussions (Barry and Stewart, 1997).

Furthermore, a high level of extraversion has been linked to conflict (Hoegl and Gemuenden, 2001; Mohammed and Angell, 2004; Morgeson et al., 2005). In this aspect, the present research has focused on the negative side of disputes and rivalry. However, while conflicts can quickly escalate and become very destructive (Kutzberg and Amabile, 2001), not every disagreement is bound to turn into a big dispute. Task-based conflict can, if it is constructive, respectful, and information-related, be beneficial to creativity and innovation. This is because it leads team members to exchange information, re-evaluate the status quo, and explore opposing opinions, which can foster new innovative ideas (Tjosvold, 1985; West, 2002).

Considering these points, extraversion does clearly also have aspects that are beneficial to team creativity. The present research assumed that the negative effects on team dynamics would outweigh these positive points. However, this might not, or not always, be the case. Further research is needed to better understand the contradicting effects extraversion has on team creativity.

Conclusion

As creativity has become vital for any organization's success and survival (Gupta et al., 2016), the question of how innovative performance can be maximized is receiving increasing attention from both theorists and practitioners (Anderson et al., 2014). However, despite the wide use of teams for creative tasks and promising potential benefits of teamwork, little is still known about how individual factors affect innovative output on a collective level.

The present study makes a meaningful contribution to the creativity literature by advancing the understanding of team creativity and showing that certain factors can take a very different effect in the social context of teamwork than they do on the individual level. Specifically, it was found that a high level of agreeableness among team members can positively affect the team's potential to tap its members' creative ability, generate team synergies, and create highly innovative output. Thereby, the findings highlight the important role that the social context plays in teamwork. They suggest that factors that determine social interactions and team dynamics are likely to have a substantial impact on a team's innovative outcome. While this study focused on the moderating role of two specific traits – extraversion and agreeableness – future research could further elaborate on the role that creative ability and personality play on the team level and further expand the theoretical understanding on how creativity can be promoted and maximized.

Despite the care and thoughtfulness that were put into constructing and conducting this study, there are certain limitations that need to be taken into account. First, the data was collected from students that participated in this study as part of a class

assignment. While this can provide general insights into how creative ability and personality affect group creativity, organizational variables and the different social context might lead to different behavior and different group dynamics. Thus, some caution needs to be taken when generalizing the results to the actual workplace.

Second, it is important to consider that there are several ways of measuring team composition (Barrick et al., 1998). While this study used a mean score for creative ability and personality, other methods might provide different insights. Barry and Stewart (1997) suggested that the proportion of team members with a certain trait might play an important role, and that even one member with a very high or low level of a certain characteristic could have a big impact on effective team functioning. Also Kristof-Brown et al. (2005) state that the fit between members could be crucial to fill a gap or offset a weakness. Future studies could thus analyze how the variability of extraversion and agreeableness among team members affects group creativity. They could also use highest and lowest individual-trait scores to see if, for example, one very disagreeable member would be enough to disturb creative group dynamics.

Last but not least, there are a couple of factors that could not be included in this study. As the struggle for leadership seems to play an important role in how extraversion affects team processes it would be interesting to see how the appointment of a group leader would change the group dynamics. If there is an official leader then role conflicts and ambiguities might be reduced and dysfunctional processes could potentially be prevented. Moreover, it seems fruitful to explicitly analyze the mediating effect of team dynamics to better understand how exactly individual characteristics are translated into team output.

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국문초록

창의력과 혁신은 모든 조직의 성공과 생존을 결정 짓는 중요한 요소가 되었다. 그러나 창의적인 업무 수행 시 팀 수준에서 많이 이루어진다는 점과 팀워크의 전도유망한 잠재적 이점들이 있음에도 불구하고, 팀 창의력을 결정하는 요인에 대해서는 여전히 연구된 부분들이 많지 않다. 이 연구는 팀 구성원의 창의력과 성격이 혁신적인 팀 성과에 미치는 영향을 분석함으로써 팀 창의력에 대한 이해를 증진시키고자 한다. 한 학기 학부생 및 MBA 학생들로 구성된 43 명의 팀은 새롭고 창의적인 사업 아이디어를 창안하도록 지시 받았다. 객관적 및 주관적 혼합 측정 방식은 팀의 창의력, 외향성 및 친화성 수준뿐 만 아니라 최종 결과물의 혁신의 정도를 평가하는데 사용되었다. 연구 결과, 친화성이 창의력과 혁신적인 팀 성과 간 관계에 긍정적인 조절 변수로 작용함이 보였다. 이러한 점은 팀워크에서 사회적 맥락이 중요한 역할을 할 수 있다는 점을 나타낸다. 더불어, 팀 수준에서는 특정 요소가 개인 수준에 영향을 미치는 경우에 비해 매우 다르거나 혹은 오히려 반대되는 영향을 미칠 수 있음을 보였다.

주요어: 창의성, 혁신, 팀, 성격, 창의적 능력, 친화성, 외향성

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