COGNITIVE STYLES AND TEAMWORK: EXAMINING THE IMPACT OF TEAM COMPOSITION ON TEAM PROCESSES AND OUTCOMES

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ABSTRACT

The question whether diversity is advantageous or disadvantageous for teams has yet to be resolved. The present research investigates the effect of cognitive diversity on team processes and outcomes through two successive studies with experimental team tasks involving 57 teams of management students (N = 288). Team composition in each of the studies was manipulated on the basis of students' cognitive profiles, as measured with the Cognitive Style Indicator (CoSI), leading to homogeneously composed teams, semi-homogeneous teams, and heterogeneous teams. Contrary to previous research, the time needed to complete the task was longer in homogeneous teams than in semi-homogeneous and heterogeneous teams, and team composition had no effect on performance or satisfaction. Apart from heterogeneous teams showing to be more task oriented, there seemed to be no relationship between team composition and team process variables, including perceived relational orientation, and groupthink. However, in the different homogeneous teams, the perception of individuals with different cognitive styles did vary on these dimensions. Cognitive styles were also significantly related to preferences for certain task types. The relevance of these findings is discussed in the light of the recruitment and staffing decisions and pathways for future research are indicated.

Keywords: team diversity, cognitive styles, team effectiveness, team satisfaction, task orientation, relational orientation

INTRODUCTION

To answer the ever more competitive challenges in the global marketplace, organizations increasingly turned to teams over the last decades (Zaccaro, Rittman, & Marks, 2001). Organizational leaders and managers are convinced that collaborative teamwork is an effective tool to manage complex tasks in a rapidly changing world (LaFasto & Larson, 2001). Moreover, teams increasingly perform cognitive tasks in our information age (Hinsz, Tindale, & Vollrath, 1997) and they are used as basic units of decision making (Lant & Hewlin, 2002), as teams can integrate and process information in ways that individuals cannot (Deeter-Schmelz & Ramsey, 2003). These shifts from simply working together to an increased emphasis on knowledge sharing led to a growing interest in teams as information processors (McGrath, 1997). Parallel with the increased popularity of teams in organizations, research interest in team characteristics contributing to their effectiveness has grown strongly (Campion, Papper, & Medsker, 1996; Hyatt & Ruddy, 1997; Mathieu, Maynard, Rapp, & Gilson, 2008). The aim of this kind of research is to gain insight into the determining factors of team effectiveness and ultimately to formulate recommendations for the design of high-performing teams.

Despite a longstanding research history, no consensus has been achieved regarding the nature (beneficial or hampering) of the effects of team diversity on team performance (Jackson, Joshi, & Erhardt, 2003; Joshi & Roh, 2009; van Knippenberg & Schippers, 2007). Generally, research concludes that team heterogeneity is a double-edged sword: it seems to improve the quality of team decision making, but meanwhile also increases the likelihood of process problems (Horwitz & Horwitz, 2007; Milliken & Martins, 1996; Stewart, 2006; Webber & Donahue, 2001; Williams & O'Reilly, 1998). In addition, diversity has been investigated in many different ways. A number of researchers proposed typologies to classify different dimensions of diversity, distinguishing between easily observable demographic variables (e.g., gender, race, age) and less easily noticeable, job-related attributes (e.g., function, education, tenure) (Jehn, Northcraft, & Neale, 1999; Joshi & Roh, 2009; Milliken & Martins, 1996; Pelled, Eisenhardt, & Xin, 1999). Different researchers stressed the importance of studying differences that are not readily visible and not always job-related (e.g., personality, values, attitudes) (Bowers, Pharmer, & Salas, 2000; Harrison, Price, & Bell, 1998).

One of the potential factors that fits this call are cognitive styles, in particular because cognitive team diversity did not receive much attention so far (Priola, Smith, & Armstrong, 2004). Research on cognitive styles – defined as individual differences in how people perceive,

judge, process information, and decide – mainly focused on its influence on individual decision making (Armstrong & Cools, 2009) rather than on team information processing. Teamwork provides organizations with the possibility to bring people together to perform complex tasks that require different types of information processing. Little empirical work exists in the domain of team decision making, although team composition in terms of cognitive styles can have an important impact on the quality, acceptance, and timeliness of decisions (Cheng, Luckett, & Schulz, 2003; Volkema & Gorman, 1998). Given the ambiguous results in previous team diversity research and the lack of research on cognitive team diversity, the aim of this investigation was to gain further insights into the effects of cognitive styles (as input variable) on team processes, team performance, and team satisfaction through two diverse team experiments. Figure 1 summarizes the conceptual framework of this research. We subsequently elaborate on this framework and the design of this study, followed by a discussion of the results and the implications for further team research and for practice.

Insert Figure 1 about here

Regardless of a specific definition, the key to call a collective a team is that team members find themselves in a situation characterized by a certain degree of interdependence, related for instance to how their work and tasks are organized, the goals they have to achieve, or the rewards they receive (Offerman & Spiros, 2001). Teams are created for various purposes and thus face different challenges. Although several authors propose a typology to categorize teams (e.g., Cohen & Bailey, 1997; Hackman, 1990; Sundstrom, De Meuse, & Futrell, 1990), none has become widely accepted (Devine, Clayton, Philips, Dunford, & Melner, 1999). However, as other factors influence team effectiveness in diverse team types, it is important to specify the type of team that we will study. We focus on ad hoc project teams. Defining features of ad hoc project teams are (a) that the team tasks revolve around processing information – like planning, creating, choosing, or deciding – in contrary to production tasks; and (b) that they are formed for a finite period of time contrary to long-term, ongoing teams (Devine et al., 1999). As organizations often use this type of temporary teams to achieve specific short-term objectives (e.g., developing a corporate vision, implementing a new project) (Grawitch, Munz, Elliott, & Mathis, 2003), increased insight about the effects of cognitive team composition on the team processes and outcomes of these types of teams is highly valuable.

Cognitive styles

One factor accounting for team diversity is cognitive style. According to Armstrong and Priola (2001, p. 287) cognition refers to "the activities of thinking, knowing, and processing information", and cognitive style to "the possibility that different people may carry out these processes differently". Cognitive psychologists who did research on problem solving and perceptual and sensory functions developed the term cognitive style (Grigorenko & Sternberg, 1995; Kozhevnikov, 2007). Witkin, Moore, Goodenough, and Cox (1977) defined a cognitive style as the individual way a person perceives, thinks, learns, solves problems, and relates to others. Other scholars describe cognitive styles as the way in which individuals characteristically and consistently organize and process information and arrive at judgments or conclusions on the basis of their observations (Hunt, Krzystofiak, Meindl, & Yousry, 1989; Tennant, 1988). Building further on these conceptualizations, we define a cognitive style as the way people perceive stimuli and how they use this information to guide their behavior (i.e., thinking, feeling, actions).

Scholars have identified a large variety of cognitive style models (for a recent review, see: Kozhevnikov, 2007). One approach to classify diverse cognitive style theories is on the basis of the number of cognitive style dimensions they identified, distinguishing between unidimensional models (i.e., bipolar models that distinguish between two cognitive styles situated on a continuum) versus multidimensional models (i.e., cognitive style theories that distinguish different dimensions) (Cools, 2008). While an important stream of research within the style field still adheres to a unidimensional perspective that makes a distinction between an analytic and an intuitive way of thinking (Hodgkinson & Sadler-Smith, 2003), multidimensional views on style are getting more important (e.g., Epstein, 1994; Kozhevnikov, 2007; Sadler-Smith, 2009). In the light of this evolution, Cools and Van den Broeck (2007) developed and validated a cognitive style model and instrument – the Cognitive Style Indicator (CoSI) – that is a refinement of the analytic-intuitive cognitive style dimension. Their research suggests that it is worthwhile to distinguish three cognitive styles (a knowing style, a planning style, a creating style), which initially stem from the traditional conceptualization of the bipolar analytic–intuitive cognitive style dimension, without further framing them conceptually on a

single dimension. These authors believe in a more flexible approach in which people can simultaneously score high or low on several styles, which fits the recent calls to establish a more flexible point of view in style research (Hodgkinson & Sadler-Smith, 2003; Miron, Erez, & Naveh, 2004).

Summarizing previous qualitative and quantitative research with this new instrument (Cools, 2008; Cools & Van den Broeck, 2007; 2008; Cools, De Pauw, & Vanderheyden, 2009a; Cools, Van den Broeck, & Bouckenooghe, 2009b), it has been found that people who score high on the *knowing style* ('knowers') have a preference for logical, analytical, and impersonal information processing. They have strong analytical skills, are good in logical reasoning, search for accuracy, and like to make informed decisions on the basis of a thorough analysis of facts and figures and logical and rational arguments. People scoring high on the *planning style* ('planners') are attracted by structure; they search for certainty, and prefer a well-organized environment. Planners like to make decisions in a structured way and are mostly concerned with the efficiency of the process. People who score high on the *creating style* ('creators') search for renewal and have a strong imagination. They like to work in a flexible way and have a preference for a creative and unconventional way of decision making. Creating people tend to make decisions primarily based on intuition or 'gut-feeling', using objective information and data only in a second phase. Within this study, three different team compositions were studied: homogeneous teams (in which one cognitive style was represented), semi-homogeneous teams (with two dominant cognitive styles), and heterogeneous teams (in which the three cognitive styles were represented).

Team processes

To understand team processes, it is useful to define a set of categories in which team interactions can be coded. We distinguish between variables concerning two fundamental dimensions underlying team dynamics, introduced by Bales (1950, 1965, 1970): task and relational orientation (e.g., Forsyth, 1983). First, we will explore task and relational orientation as general team dynamics, after which we will examine a specific aspect of each of these two dynamics, this is team task preferences (task dimension) and groupthink (relational dimension) respectively.

Following the study of Armstrong and Priola (2001), we make a distinction between two major categories of team processes: social-emotional activities and task-related activities. Social-emotional processes refer to group solidarity, attraction between members, integration, maintenance or destruction of harmony; whereas task-related processes are concerned with goal attainment (Littlepage, Cowart, & Kerr, 1989; Zaccaro, 1991). Although this distinction between task- and relational-orientation is an important one, not much research has been conducted on the link between team composition and the task- versus relational-orientation of teams. According to Allinson, Armstrong, and Hayes (2001), the similarity-attraction paradigm suggests that homogeneity of cognitive styles may lead to positive interpersonal relationships and, as a consequence, to higher social-emotional orientation. Hence, we hypothesize that:

> Hypothesis 1: Members of homogeneous and semi-homogeneous teams will be more relationally oriented than those of heterogeneous teams.

Since cognitive heterogeneity causes more different points of view to be shared (Milliken & Martins, 1996), we expect heterogeneous teams to be more goal-oriented and therefore to be more concerned with the task than members of homogeneous and semi-homogeneous teams. Therefore, we will test the following hypothesis:

> Hypothesis 2: Heterogeneous teams will be more task oriented than homogeneous or semi-homogeneous teams.

Apart from the overall team composition, we also expect that there will be a different orientation amongst the varying homogeneous teams, depending on their dominant cognitive profile. Empirical research has shown that individuals with a predominantly analytic cognitive style tend to be more task-oriented, more impersonal, and more self-controlling in their emotional behavior. Intuitive people were found to be more interpersonally oriented, expressive, relatively friendly, warm towards others, and serving more psychosocial functions during interpersonal relationships (for an overview of these findings, see: Allinson et al., 2001; Armstrong, Allinson, & Hayes, 1997; 2002; 2004; Witkin & Goodenough, 1977). We hypothesize that:

Hypothesis 3: When working in a homogeneous team, creators will be more relational-oriented than knowers and planners.

Hypothesis 4: When working in a homogeneous team, knowers and planners will be more task-oriented than creators.

Task type preference

Although people have a preferred or dominant cognitive style, their actual decision making behavior is also influenced by the demands of the situation or the decision making task (Leonard, Scholl, & Kowalski, 1999). Prior team research also suggests that task differences moderate the relationship between team inputs, processes, and outputs (De Dreu & Weingart, 2003; Franz & Larson, 2002; Stewart & Barrick, 2000). According to Straus (1999, p. 166), "one cannot fully understand group process or performance without taking into account the nature of tasks being performed". To describe the different types of team tasks, we use McGrath's (1984) widely used team task circumplex (e.g., Argote & McGrath, 1993; Goodman, Ravlin, & Schminke, 1987; Jackson, 1992). This model distinguishes four basic processes and different tasks linked to these processes: generate (creativity and planning tasks), choose (intellective and judgment tasks), negotiate (cognitive conflict and mixed-motive tasks), and execute (psychomotor tasks and contests/battles) (Straus, 1999). As will be explained in more detail in the method section, the team task in our first experiment involved one single task type: reaching consensus on the ranking according to the value of a range of objects, which is a judgment task. The team task in our second experiment consisted of three different task types, each requiring different cognitive skills: a planning task (requiring planning and conceptualization), a judgment task, and a creativity task. According to Straus (1999), planning tasks require idea generation and each member can independently contribute ideas. Judgment tasks do not have a correct answer; team members must share their information and look for a preferred alternative. Creativity tasks are collaborative; the team members do not have to agree on a single best response, as each original idea increases the team's productivity.

Based on the research discussed in previous paragraphs, one could assume that individuals with different cognitive styles would prefer different kinds of tasks. Summarizing previous studies on the link between cognitive styles and work environment preferences

(Allinson & Hayes, 1996; Hirsh & Kummerow, 2000; Kirton, 1994; Whooten, Barner, & Silver, 1994), it is clear that analytical thinkers prefer to work in well-defined, stable, structured, ordered, and relatively impersonal situations, in which they can function within existing rules and procedures and prevailing structures. Researchers found that people with an intuitive style favor unstructured, changing, highly involving, innovative, flexible, dynamic, relatively personalized environments, in which they can work autonomously and in freedom from rules and regulations. We therefore hypothesize that:

> Hypothesis 5: Knowers and planners will have a higher preference for the planning task than creators.

> Hypothesis 6: Knowers and planners will prefer the judgment task more than creators.

> Hypothesis 7: Creators are more likely to prefer the creativity task than knowers and planners.

Groupthink

Group cohesiveness usually is a positive thing, but it can also have negative consequences, such as groupthink. Janis (1982, p. 9) defines groupthink as "a mode of thinking that people engage in when they are deeply involved in a cohesive in-group, when members' strivings for unanimity override their motivation to realistically appraise alternative courses of action". Groupthink makes team members look for concurrence and unanimity, which in turn leads to poor decision making (Mullen, Anthony, Salas, & Driskell, 1994). Groupthink is more likely to occur in tightly-knit cohesive groups (Vanderheyden, Cools, & Debussche, 2006). Consistent with aforementioned similarity-attraction paradigm (Byrne, 1997), we therefore hypothesize:

> Hypothesis 8: Members of homogeneous and semi-homogeneous teams will show higher levels of groupthink than those of heterogeneous teams.

In addition, Bernthal and Insko (1993) address the fact that in most teams two kinds of cohesiveness exist: task-oriented and social-emotional oriented cohesion. Their research concluded that members of teams with high social-emotional cohesion are more likely to experience the symptoms of groupthink than members of highly task-oriented cohesive teams. Consistent with Hypotheses 3 and 4, this leads us to expect the following:

Hypothesis 9: When working in a homogeneous team, creators show higher levels of groupthink than knowers and planners.

Team outcomes

A large variety of criteria are used in team literature to determine team effectiveness (Brodbeck, 1996; Ilgen, 1999; Sundstrom et al., 1990). According to Sundstrom and colleagues (1990, p. 130), "progress in studying and managing work teams depends on having a well-accepted, measurable criterion of effectiveness". Most team researchers seem to agree that effectiveness includes more than performance, but the 'more' remains an issue (Sundstrom et al., 1990). In their review of team research, Cohen and Bailey (1997) define team effectiveness broadly to include the multiplicity of team outputs that matter in organizations. They distinguish between performance effectiveness (e.g., quality, productivity, efficiency), member attitudes (e.g., satisfaction, organizational commitment), and behavioral outcomes (e.g., turnover, promotions). As we focus on temporary project teams, we will only include measures of performance (objective outcomes: solution quality and time needed) and attitude (subjective outcomes: team member satisfaction). Objective performance measures are usually related to the task type requirements (e.g., number of ideas in an idea-generation task, solution to a problem). Team member satisfaction refers to the degree to which people are happy working in the team. Affective outcomes are of utmost importance for temporary teams, as they might influence other aspects of people's job and their willingness to participate in similar teams in the future (Grawitch et al., 2003). First, we will focus on objective team performance, then we will investigate satisfaction with the team process and output (subjective).

Performance and time needed

We measured objective performance outcomes in our first experiment, distinguishing between the time needed to perform the task and the degree of resemblance with the 'ideal' solution to the stated team problem. In an early study using Management Information Systems (MIS) project teams composed of different personality types, White (1984) concluded that the more heterogeneous teams (i.e., containing four different types) were more successful than the less heterogeneous teams (i.e., containing two different types) in their systems development activities. Basadur and Head (2001) concluded that heterogeneity in cognitive styles had a positive effect on team performance in a creative problem solving task and homogeneity of cognitive styles in a team led to less time needed to complete the task. With regard to semi-homogeneous teams, Basadur and Head (2001) found evidence that these teams were outperformed by heterogeneous teams. We hypothesize:

Hypothesis 10: Heterogeneous teams will outperform semi-homogeneous teams and homogeneous teams.

Hypothesis 11: Heterogeneous teams will need more time to complete their team task than semi-homogeneous and homogeneous teams.

Satisfaction

As diversity research has focused mainly on team-level performance variables, not so much is known about the effects of diversity on individual-level affective variables such as team member satisfaction (Gevers & Peeters, 2009). However, team researchers agree that individual satisfaction represents an important aspect of work team effectiveness (Campion, Medsker, & Higgs, 1993; Hackman & Wageman, 2005), as employees' commitment and performance in present and future teamwork is influenced by their previous experiences in teams (Lester, Meglino, & Korsgaard, 2002; Nerkar, McGrath, & MacMillan, 1996). Based on the similarity-attraction paradigm, Byrne (1997) explains that individuals will feel better when accompanied by similar others, as they expect their own values and beliefs to be reinforced. Following the social identity theory (Tajfel & Turner, 1979, 1986), we expect a negative relation

between the level of team heterogeneity and the extent to which team members identify with the team. Previous studies found that cognitive style congruence in dyads led to satisfaction with the relationship, mutual understanding and liking, effective interpersonal relations, and effective communication (for an overview of these studies, see: Allinson et al., 2001; Armstrong, 2000). On the contrary, cognitive dissimilarity may result in conflict because style differences lead to different interests, values, and problem-solving approaches. For example, Kirton (1994) found that people with different cognitive styles held pejorative views of each other. Based on previous research, we hypothesize that the higher the diversity in a team, the lower the integration of the team members and the higher the level of dissatisfaction (Jackson, Brett, Sessa, Cooper, Julin, & Peyronnin, 1991; O'Reilly, Caldwell, & Barnett, 1989; Wagner, Pfeffer, & O'Reilly, 1984).

> Hypothesis 12: Members of heterogeneous teams will be less satisfied with the teamwork than members of homogeneous or semi-homogeneous teams.

METHOD

We conducted two successive studies with an international sample of management students performing an experimental team task in teams of four to six people.

Sample

Combining the samples of the two studies, a total of 365 postgraduate Master in Management students from a leading European business school participated in this research, of which 288 (79 per cent response rate) handed in both questionnaires required to be included in the data analyses. Among these students, 196 were men (68%) and 92 women (32%). Their age ranged from 21 to 36 (M = 23.08, SD = 1.64).

Procedure

Both studies were preceded by administering a cognitive style questionnaire (CoSI). Teams consisted of four to six members and were composed according to the results of this questionnaire to vary the extent of cognitive heterogeneity. They were set up to fall into one of three categories:

- homogeneous teams, in which only one cognitive style is present (8 teams in study 1 and 11 in study 2);
- semi-homogeneous teams, combining two styles (7 and 14, resp.), and;
- heterogeneous teams, with all three cognitive styles represented (8 and 6, resp.).

In study 1, the problem-solving task used was the 'Lost at Sea' exercise (Nemiroff & Pasmore, 1975), which has been extensively used in previous team research (Harris & Nibler, 1998; Nibler & Harris, 2003). Apart from the background story, it is identical to the 'Moon Survival Exercise', which Rogelberg, Barnes-Farrell, and Lowe (1992, p. 732) called "an analogue to the types of problems faced by managers" and which has been used accordingly in previous research (Bottger & Yetton, 1987; Yetton & Bottger, 1982). The 'Lost at Sea' exercise is a simulation game in which participants have to imagine they just survived a shipwreck. They find themselves in a live boat with a limited amount of items they managed to save from the wreck. Their task consists of ranking these items according to their importance for survival. After all team members have ranked the items individually, the team has to attain consensus on a common ranking.

For the second study, we designed the 'Build a Village' exercise, in which teams have to design an imaginary village, following certain rules and restrictions and using a limited budget. In a second phase, they also have to build a scale model of this village, limited only by their imagination. In addition, they have to choose a project leader from a list of four resumes, each with a specific profile description. In this sense, this team task consisted of three subtasks: a planning task (planning how to build the village), a judgment task (choosing a project leader), and a creativity task (building a scale model).

After the exercises, participants in each of the studies were asked to complete a questionnaire on the teamwork. These questionnaires were nearly identical in both studies, except for some items that were only relevant for a specific aspect of the task. Hence, if possible, the data of both studies were combined in the analyses to create a larger sample and to avoid limiting the findings to one specific task.

Measures

Cognitive styles

Cognitive styles were measured using the Cognitive Style Indicator (CoSI; Cools & Van den Broeck, 2007). The CoSI is an 18-item questionnaire, measuring individual differences with regard to how people prefer to perceive, process, and structure information. Items are scored on a five-point Likert scale ranging from 1 ('totally disagree') to 5 ('totally agree'). The measure distinguishes between a knowing style (α = .80, 4 items, e.g. 'I like to analyze problems'), a planning style (α = .85, 7 items, e.g. 'I prefer clear structures to do my job'), and a creating style (α = .81, 7 items, e.g. 'I like to extend the boundaries'). Previous research with the CoSI in various Western and non-Western samples supported the construct validity of the instrument. Reliability, item, and factor analyses in each of these studies confirmed the internal consistency and homogeneity of the three cognitive styles (Cools & Van den Broeck, 2007; 2008; Cools et al., 2009a; 2009b). Groups were formed based on members' highest cognitive style. A style was considered high when an individual scored above percentile 66.

Team processes

To measure the perception with regard to the team processes, we adopted items from previous research assessing constructs such as groupthink, cohesiveness, group effort, and group climate (Bernthal & Insko, 1993; Rogelberg et al., 1992) As there was some overlap between the different scales, we constructed our own subscales, based on factor analyses (see Results section). All items were scored on Likert scales (except for task preferences), ranging from 1 ('I completely disagree') to 5 or to 9 ('I completely agree'), depending on the original format in previous research, or on a five-point bipolar scale with opposing adjectives on either side (e.g., 'cold–warm'). Preference for task type was only measured in study 2. We used the item 'Which of these tasks did you

prefer?', relating to the planning, judgment, and creativity tasks discussed above. Each task was given a rank from 1 to 3, with one being the highest preference.

Team outcomes

We assessed the objective outcomes by measuring the team's performance and the time needed to complete the task, and the subjective outcomes by measuring people's satisfaction with the teamwork. Team performance, this is the team's decision effectiveness, was measured by aggregating the absolute differences between the ranks assigned by the team for each item and those assigned by experts in sea disaster survival from the US Marine, as was the procedure in previous research (Harris & Nibler, 1998; Nibler & Harris, 2003). Resulting team performances ranged from 0 to 56 on a maximum of 128 (*M* = 32.42, *SD* = 14.65), with lower scores indicating better performances. Time needed to reach group consensus was measured by an observer (*M* = 22.31 minutes, *SD* = 8.98 minutes). Due to the nature of the team tasks, the objective outcome variables could only be measured in study 1 at team level (*n* = 23). Satisfaction was measured in both studies using Basadur and Head's (2001) Team Satisfaction Index Questionnaire. The instrument consists of four items (e.g., 'How good did you feel about the quality of the output?'), scored on a ten-point Likert scale ranging from 'very bad' (1) to 'very good' (10) or from 'not at all' (1) to 'a lot' (10).

RESULTS

Except for team performance and time needed to complete the task, all data were analyzed at the individual level, since they all assess individual perceptions. Aggregating these to the team level could obscure the psychometric characteristics of items by collapsing down distribution statistics to the mean score (Anderson & West, 1998). It could also rule out possible inter-individual differences within the team (Gevers & Peeters, 2009; Peeters, Rutte, van Tuijl, & Reymen, 2006), particularly in the case of heterogeneous teams.

To explore the effect of cognitive diversity on process variables, we first conducted an exploratory principal components analysis on all items measuring team process aspects. We found three internally and semantically coherent factors, jointly explaining 39 per cent of the variance (see Table 1): relational orientation, task orientation, and groupthink. We used Ford, MacCallum, and Tait's (1986) criterium of .40 as a critical cut-off load to adopt an item into a scale. Cronbach's alpha coefficients for these scales were .90, .76, and .73 respectively.

Insert Table 1 about here

Comparing homogeneous, semi-homogeneous, and heterogeneous teams on the process variables, one-way ANOVAs revealed no significant differences in the individuals' perception of relational orientation, $F(2, 232) = .41$, $p = .67$, and groupthink, $F(2, 91) = 1.26$, $p = .30$, yielding no support for Hypotheses 1 and 8. There was, however, a significant difference in task orientation between different group compositions, $F(2, 227) = 3.83$, $p < .05$, showing that individuals in homogeneous teams perceived more task oriented behavior than those in semi-homogeneous teams. These findings reject Hypothesis 2.

Insert Table 2 about here

To test Hypotheses 3, 4, and 9, we conducted a series of one-way ANOVAs (see Table 3) to compare individuals in diverse homogeneous teams. With regard to perceived relational orientation, a significant difference was found between the diverse homogeneous teams, $F(2, 72) = 6.23$, $p < .01$. A Scheffé-corrected procedure revealed that people with a creating style were more relational oriented than people with a knowing style, but they did not differ significantly from the planners. This partly confirms Hypothesis 3. A significant difference in task orientation was also observed, $F(2, 71) = 5.10$, $p < .01$. Planners were found to be more task-oriented than people with a creating style and with a knowing style, which is a partial confirmation of Hypothesis 4. Furthermore, a marginally significant difference indicated that planners perceived higher levels of groupthink in their teams than creating types, $F(2, 29) =$

3.53, *p* < .10. This result did not confirm Hypothesis 9. No significant difference was found in perceived groupthink between people with a knowing style and a creating style.

Insert Table 3 about here

Regarding the task type preference, Mann-Whitney tests (see Table 4) revealed that people with a knowing style had a greater preference for the planning task than people with a creating style (*U* = 48.00, *p* < .01). A marginally significant result indicated that people with a planning style had a greater preference for the planning task than the creating people (*U* = 192.00, *p* < .10). These findings partially confirmed Hypothesis 5. Knowers liked the judgment task more than planners did (*U* = 54.00, *p* < .05), but no significant difference was found between the knowing style and the creating style for this task type. These findings reject Hypothesis 6. Creators liked the creativity task more than the knowers (*U* = 46.00, *p* < .01), as expected in Hypothesis 7. No significant difference was found between creators and planners.

Insert Table 4 about here

Team outcomes

Looking at objective team outcome differences (Table 5), we conducted two one-way ANOVAs for group composition on team performance and time needed to finish the task. Somewhat surprisingly, analyses showed no significant performance difference between homogeneous, semi-homogeneous, and heterogeneous teams, *F*(2, 20) =.20, *p* = .82. Even more surprising was the significant time difference, *F*(2, 17) = 6.59, *p* < .01, showing that heterogeneous and semi-homogeneous teams needed significantly less time than homogeneous teams to complete their task. Hence, Hypotheses 10 and 11 were not confirmed.

Insert Table 5 about here

As the four satisfaction items measure different aspects of satisfaction, they were analyzed separately (Basadur & Head, 2001). Contrary to Hypothesis 12, none of the ANOVAs indicated a significant difference between individuals from homogeneous, semi-homogeneous, and heterogeneous teams (see Table 6).

Insert Table 6 about here

DISCUSSION AND CONCLUSION

The aim of our research was to shed further light on the impact of cognitive style differences (as input variable) on team processes, team performance, and team satisfaction through two diverse team tasks. The uniqueness of this study on cognitive team composition lies in its multidimensional perspective with regard to cognitive style differences (i.e., three different cognitive styles rather than one continuum with two poles) and the joint investigation of team processes and team outcomes. In general, the results of this study indicated that heterogeneity in cognitive styles does not always lead to better team performance neither that homogeneous teams are always faster in decision making, in contrary to widely held assumptions. In addition, the study clearly shows that differences exist between homogeneous teams with regard to the team processes and task preferences. Hence, cognitive styles do have an influence on the way teams work and on the type of tasks individuals like to do.

Discussion of findings

Looking at the process variables, contrary to our hypotheses, no significant differences were found concerning relational orientation and groupthink between homogeneous, semi-homogeneous, and heterogeneous teams. Concerning task orientation, analyses showed that individuals in homogeneous teams perceived more task oriented behavior than those in semi-homogeneous teams, and although not significant, members of heterogeneous teams also perceived more task oriented behavior than members of semi-homogeneous teams. These

findings seem to suggest a U-shaped relation between cognitive diversity and task orientation, opening a possible pathway for future research.

Focusing on the homogeneous teams, results indicated that teams with a dominant creating style were more relational oriented, while teams with a dominant planning style seemed to be more task oriented. This confirms the study of Armstrong and Priola (2001), which found that intuitive individuals tended to be more emotionally expressive and interpersonal, whereas analytic individuals tended to be more task oriented and impersonal. Homogeneous intuitive teams tended to initiate more social-emotional behaviors.

The risk of groupthink was found to be somewhat higher in homogeneous teams consisting of planners. A possible explanation for this finding might lie in the research of Kirton and de Ciantis (1986), who concluded that adaptors (i.e., analytical thinkers) may be more likely to feel the discomfort of not agreeing since they are concerned with fitting in. Cools and Van den Broeck (2008) also found that planners far more than knowers valued dealing with other people in a diplomatic way, as they attach much importance to being in harmony with them.

Concerning task type preferences, our results indicated that knowers and planners liked the planning task significantly more than the individuals with a creating style. With regard to the judgment task, the knowing people prefer this task significantly more than the planners. People with a creating style like the creativity task significantly more than the knowers and the planners. These findings confirm previous research that found relations between cognitive style differences and task type and work environment preferences (Cools & Van den Broeck, 2008; Cools et al., 2009b; Whooten et al., 1994). Importantly, by extending these findings to the team context, our research clearly shows that the ideal cognitive team composition is contingent on the task the team has to perform, as was also concluded by Fisher, Macrosson, and Wong (1998).

Concerning satisfaction with the teamwork, no significant differences were found between homogeneous, semi-homogeneous, and heterogeneous teams. A possible explanation here is that satisfaction is a complex and multifaceted phenomenon (Wright & Bonett, 2007); it is possible that dissatisfaction with one aspect is compensated by satisfaction with another aspect. Further research needs to be conducted to get a clearer view on the role of team composition in relation to team satisfaction.

Looking at the task outcomes, our results unexpectedly showed no significant differences in performance between homogeneous, semi-homogeneous, and heterogeneous

teams. The type of task used in this team research could be one of the reasons why we did not find any differences. According to Milliken and Martins (1996), the advantage of diversity is a greater variety of perspectives to be used in decision making and an increase in creative and innovative solutions. However, the 'Lost at sea' exercise is a judgment task in which the participants have to search for the best solution. They do not have to come up with their own creative solution. Our findings do support the results of the meta-analyses done by Bowers and colleagues (2000) and Webber and Donahue (2001), indicating that research so far has shown inconsistent results concerning the relations between different forms of diversity and team performance.

With regard to the time needed to finish the task, in contrast to our hypothesis, heterogeneous and semi-homogeneous teams needed significantly less time than homogeneous teams. Again, an explanation might be found in the type of task used for this research. As a judgment task does not have a correct answer, the team members must look for a preferred rather than a correct answer. Therefore, judgment tasks often lead to conflicting viewpoints, which cannot be solved by only presenting factual information (Straus, 1999). Heterogeneous teams might be better in communicating the different points of view and in solving the conflicts. Teams with homogeneous cognitive profiles can get stuck on a certain problem, lacking the beneficial input from other ways of looking at the problem.

Research implications

In addition to the research suggestions above, we also want to address the limitations of our study and propose some other avenues for further research. These suggestions aim to contribute to a more fine-grained view on the effects of (cognitive) team composition on team process and outcomes and in this sense can lead to further insights about why several hypotheses were not supported in this research.

A first possible limitation of the study is the fact that we worked with student samples, although the tasks they had to solve were analogous to the type of tasks that are faced by managers. Future research could explore cognitive diversity in teams with real world work experience. Similarly, as Joshi and Roh (2009) recommended in their review, it is important to take the context into account, since the context is a possible cause for inconsistent findings in

team research. Factors such as task type, team members' educational level, long- versus short-term team existence might account for differential effects of cognitive team composition.

It could also be interesting to explore the effects of cognitive team composition on the different phases of the teamwork, this is problem generating, problem formulating, solution developing, and solution implementing (Joshi, Pandey, & Han, 2009). Although we did include the team process in our investigation, we used a fairly static conceptualization of it and did not link the cognitive style diversity to the different phases in the teamwork. Different team researchers identified a lack of attention for team processes in empirical research and call for a dynamic perspective to address this gap (Gibson, 2001; Marks, Mathieu, & Zaccaro, 2001; Weingart, 1997).

Finally, in line with the previous suggestion, Harrison, Price, Gavin, and Florey (2002) found that the effect of surface-level as well as deep-level diversity on team performance changed over time through social integration. Since cognitive styles have not been used much as input variable to measure team diversity, it might be interesting to study lasting teams in a longitudinal way and see if our findings would be robust over time. Extended experience in working together may change team members' initial stereotype-based impressions about other team members (van Knippenberg & Schippers, 2007).

Practical implications

As organizations increasingly search tools to compose high-performing teams, knowledge of cognitive styles and their impact on team information processing can contribute to effective team staffing. Several researchers identified cognitive styles as a critical intervening variable in work performance that can be useful to build effective teams (Chan, 1996; Hayes & Allinson, 1994; Sadler-Smith, 1998). Although researchers recognize the values of cognitive styles for team performance, up till now little empirical research exists that can help managers and organizations to compose teams based on cognitive styles (Armstrong & Cools, 2009).

In addition, existing teams can use the findings of this study to enhance cooperation between team members and to reduce miscommunication and conflicts. A useful strategy for managers to increase team performance, apart from changing the team composition, is making better use of the characteristics that team members already possess (Moreland, 1999).

Managers can assign specific roles to team members to optimize the fit between their capabilities and the requirements of the team work (Driskell, Goodwin, Salas, & O'Shea, 2006). As this study also reveals that individuals have preferences in executing particular team tasks depending on their cognitive style, managers can use these insights for composing high-performing teams, matching the right profiles with the right task types.

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TABLE 1

Results of the Principal Components Analysis on the Team Processes Subscales

Item	Relational orientation [a]	Task orientation	Groupthink
I liked everyone in the group [b]	**.78**	.05	.20
I felt that people in my group had high social skills	**.69**	.07	-.14
My group was focused on keeping a positive social atmosphere	**.53**	.00	-.15
Everyone contributed to coming up with a good solution	**.46**	.23	-.12
We worked unusually well together	**.45**	.19	-.12
I was not given a chance to say what I wanted to say (R) [c]	**.42**	-.06	-.10
Confident	**.44**	.36	-.13
Enjoyable	**.82**	.01	.04
Friendly	**.80**	-.10	-.10
Socially oriented	**.74**	-.07	-.06
Humorous	**.68**	-.22	-.05
Easy-going	**.64**	-.19	-.20
Distant (R)	**-.59**	.11	.10
Communicative	**.50**	.02	-.25
Pleasant-unpleasant (R)	**-.80**	-.22	-.21
Friendly-unfriendly (R)	**-.67**	.02	.01

Overall, I feel that my group made a high-quality decision	.17	**.62**	-.26
I felt that my group was focused on completing the task	.18	**.61**	-.02
My group did not seem to take the task seriously (R)	.13	**-.58**	.31
I believe that my group's discussion was of high quality	.13	**.50**	-.45
Task-oriented	.11	**.75**	.10
Nonchalant-serious	-.13	**.68**	.24
Analytical	-.09	**.46**	-.16
Organized-disorganized (R)	.28	**-.62**	.12
Formal-informal (R)	.09	**-.45**	-.24
My group considered a lot of alternatives (R)	-.03	.12	**-.71**
If there were differences in opinion, the people in my group did not pay much attention to them	.01	.10	**.64**
I believe that the perceptions made by other group members were accurate (R)	.05	.15	**-.60**
Some members were pressured into going along with the group solution	-.04	.29	**.54**
My group went back to previously rejected ideas to re-evaluate them (R)	-.03	-.07	**-.52**
When my perceptions were not in agreement with what other members believed, I kept my views to myself	-.09	-.08	**.42**
Thoughtful (R)	.10	.22	**-.59**
Closed-minded	-.07	.00	**.48**

Notes: [a] Factor loadings of the corresponding items within the scale are in bold face. [b] In each subscale, the order of displayed items is as follows: statements, adjectives, bipolar items. [c] (R) = reverse scored item

TABLE 2

Perceived Task- and Relational-Orientation and Groupthink Differences according to Group Composition (Study 1 and 2)

Process Variable	Cognitive Team Composition	N	M	SD	F
Relational Orientation	Homogeneous	77	4.41	.45	
	Semi-homogeneous	107	4.35	.49	
	Heterogeneous	51	4.36	.43	
	Total	235	4.37	.46	.41
Task Orientation	Homogeneous	75	3.89	.49	
	Semi-homogeneous	105	3.70	.51	
	Heterogeneous	50	3.85	.46	
	Total	230	3.80	.50	3.83*
Groupthink	Homogeneous	34	2.00	.57	
	Semi-homogeneous	37	2.19	.50	
	Heterogeneous	23	2.02	.59	
	Total	94	2.08	.55	1.26

† $p < .1$, * $p < .05$, ** $p < .01$

TABLE 3

Task Orientation, Relational Orientation, and Groupthink Differences for Different Homogeneous Teams (Study 1 and 2)

	Task Orientation					*Relational Orientation*					*Groupthink*			
	n	*M*	*SD*	*F*		*n*	*M*	*SD*	*F*		*n*	*M*	*SD*	*F*
Knowing	13	3.74	.60			13	4.12	.56			4	2.19	.53	
Planning	21	4.17	.37			22	4.30	.42			9	2.33	.45	
Creating	40	3.81	.45			40	4.56	.38			19	1.78	.57	
Total	74	3.88	.47	5.10**		75	4.38	.44	6.23**		32	2.00	.58	3.53†

† $p < .1$, * $p < .05$, ** $p < .01$

TABLE 4

Mann-Whitney U Tests for Task Preference Between Individuals of Cognitive Style-Based Homogeneous Groups (Study 2)

| Task | Cognitive style | n | Mean [a] | Median [a] | U (for pairs of styles) | |
					Creating	Knowing
Planning	Creating	27	1.94	2	-	-
	Knowing	9	1.22	1	48.00**	-
	Planning	22	1.55	2	192.00†	67.00
Judgment	Creating	27	2.69	3	-	-
	Knowing	9	2.33	2	82.50	-
	Planning	22	2.77	3	163.00	54.00*
Creativity	Creating	27	1.38	1	-	-
	Knowing	9	2.44	3	46.00**	-
	Planning	22	1.68	1.5	231.50	52.50†

Note. [a] Lower ranks indicate higher preferences. † $p < .1$, * $p < .05$, ** $p < .01$

TABLE 5

Objective Team Outcome Differences according to Team Composition (Study 1)

	Independent Variable	*n*	*M*	*SD*	*F*
Performance [a]	Homogeneous	8	33.29	14.16	
	Semi-homogeneous	7	29.43	14.82	
	Heterogeneous	8	34.18	16.50	
	Total	23	32.42	14.65	.20
Time	Homogeneous	8	29.34	9.90	
	Semi-homogeneous	6	18.50	3.94	
	Heterogeneous	6	16.73	4.47	
	Total	20	22.31	8.98	6.59*

Note. [a] Lower scores indicate better performances.† $p < .1$, * $p < .05$, ** $p < .01$

TABLE 6

Subjective Team Outcome Differences according to Team Composition (Study 1 and 2)

Satisfaction item	*Independent Variable*	*n*	*M*	*SD*	*F*
How well did you work together?	Homogeneous	84	8.15	1.31	
	Semi-homogeneous	114	7.93	1.12	
	Heterogeneous	60	8.12	1.14	
	Total	258	8.05	1.20	.99
How much fun did you have?	Homogeneous	85	7.82	1.57	
	Semi-homogeneous	114	7.89	1.52	
	Heterogeneous	59	7.90	1.41	
	Total	258	7.87	1.50	.06
How much desire do you have to work with this team again?	Homogeneous	85	7.91	1.51	
	Semi-homogeneous	114	7.72	1.47	
	Heterogeneous	59	7.61	4.55	
	Total	258	7.76	1.50	.74
How good did you feel about the quality of the output?	Homogeneous	85	8.01	1.46	
	Semi-homogeneous	114	7.71	1.42	
	Heterogeneous	60	8.08	1.05	
	Total	259	7.90	1.36	1.95

† *p* < .1, * *p* < .05, ** *p* < .01

FIGURE 1

Conceptual Framework


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                            ┌─────────────────┐
                            │     INPUT       │
                            │ Cognitive style │
                            └─────────────────┘
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INPUT
Cognitive style

PROCESS

OUTCOME

TASK

Task orientation
Task type preference

RELATION

Relational orientation
Groupthink

OBJECTIVE

Performance
Time needed

SUBJECTIVE

Satisfaction