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# Impact of Spatial Distance on Individual and Group Divergent and Convergent Production

Running head: EFFECT OF INTERPERSONAL DISTANCE ON CREATIVITY

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**Abstract**

Social influence has been widely recognized to impact creative thinking in individuals and groups when brainstorming and finding creative solutions. According to theories of construal level, social facilitation, and social value orientation, spatial distance to others should facilitate this influence on two creative cognitive processes - divergent thinking (DT) and convergent thinking (CT). It was hypothesized that far distance to others (365 cm) should improve individual DT and CT over close distance to others (48 cm), while for groups, far distance should benefit DT, but limit CT. One hundred and thirty-six Dutch participants in groups of four were tested on two non-interactive and two interactive creativity tests in a partial between subject design. Results show individual flexibility, a sub-dimension of DT, to improve significantly with far distance to others as opposed to close distance to others. No significant effects could be obtained for individual CT, however the numerical difference between close and far was opposite to the hypothesized direction and social facilitation is suggested to account for the effect. No significant results could be found for group DT and CT, hinting at several limitations regarding sample, study-set up, and tasks. Follow-up research should investigate effects of social facilitation on individual creativity and remote working on group creativity. A clear need for the development of a well validated group creativity assessment tool is shown.

*Keywords:* divergent thinking, convergent thinking, group creativity, construal level theory, social facilitation, social value orientation

## Introduction

### *Convergent and Divergent Thinking - Processes of Creativity*

The only constant in this world is change (Heraclitus of Ephesus, ca. 500 BCE) which can only be mastered with innovative and useful ideas and products (Paulus & Nijstad, 2003; Amabile, 1996). These outcomes are manifested signs of creative thinking (Baas, De Dreu & Nijstad, 2008). Nowadays, creativity is an increasingly important ability demanded from employees, however, defining it has been an outlasting challenge, because it appears to be a multifaceted construct (Amabile, 1996). Only recently, authors tend to agree that creative outcomes reflect a complex interplay of multiple cognitive processes and neural networks, rather than only one cognitive process, brain area, or intellectual ability (Hommel, 2012). Two of these internal processes that contribute to the facilitation of creative performance are *divergent thinking* (DT) and *convergent thinking* (CT), first distinguished by Guilford (1967). DT is the process of producing as many multiple and alternative answers as possible to a given cue (Guilford, 1967). It involves thinking of unusual combinations and transforming information into unexpected forms (Cropley, 2006). CT, on the other hand, is the process of finding the most optimal or only solution to a clearly defined problem (Guilford, 1967). It emphasizes speed, accuracy, and analytic thinking and focuses on recognizing familiar and accumulating information (Cropley, 2006). Although it has been assumed that DT and CT appear in intertwined ways when applied to real world problems (Nusbaum & Silvia, 2011), the two processes should be looked at separately as they differ in their analytical involvement and rely on different neural mechanisms (Hommel, 2012).

### *Individual and Social Creativity*

Early creativity researchers mainly concentrated on individual creativity with little recognition of social influences on creativity in groups (Paulus & Nijstad, 2003). With

the introduction of the social creativity approach by Woodman et al. (1993), Amabile (1996), and Simonton (2000), focus shifted towards understanding the reciprocal impact of individuals' and groups' generation of creative ideas (Ashton-James & Chartrand, 2009). On the one hand, the social environment of groups and organizations can impact individuals' creative potential by means of organizational motivation to innovate, by providing resources, and applying certain management practices. This group-to-individual influence is described by Amabile (1996) in the Componential Model of Organizational Innovation. On the other hand, individuals can influence group´s creative idea generation as e.g. Nemeth (1986) showed in her comprehensive work on minority influences. A minority opinion from one of the group members was found to stimulate other group members to find new and more solutions. Remarkably, Nemeth argues that being exposed to opposing minority viewpoints leads to DT, a process where a problem is considered from various views. Furthermore, being exposed to majority viewpoints leads to CT, because people seem to focus on the one, proposed view while neglecting other considerations (Nemeth & Kwan, 1987).

Thus, individuals' creativity can be influenced by the social environment of a group and vice versa. Furthermore, as Nemeth's work shows, the kind of influence can change the way a task is processed, namely by means of CT or DT processes.

*Presence of Groups on Overall Creative Outcome*

However, there is discordance in the literature whether and when this reciprocal influence is beneficial for creativity or should be avoided. Generally, when people are in mere presence of an audience, their attention and effort increases and their performance changes (Kiesler & Cummings, 2002). Zajonc (1965) explained this with the *social facilitation effect*; when people are working on well learned or easy tasks, the presence of others increases their alertness, accuracy and speed. Yet, when people are working on difficult or unlearned tasks, the presence of others can be distracting and increases stress

and decreases the likelihood of giving poorly learned or unusual responses (Street, 1974; Kiesler & Cummings, 2002). Since brainstorming, a DT activity (Beersma & De Dreu, 2005), is often evoked by instructing participants to generate as many and as unconventional or unrealistic ideas as possible (Diel & Stroebe, 1987; Forrest, 2008), most people might have to think in an unusual or poorly learned fashion. Their performance on DT tasks should consequently decrease with the presence of others (Street, 1974). Furthermore, since creative ideas are deviant, many people are hesitant to share them in the presence of a group out of fear to be negatively judged and even rejected by the others (Goncalo & Staw, 2006). Early research could indeed find that individual brainstorming revealed to be more effective than group brainstorming (Diel & Stroebe, 1950).

As for CT, Paulus and Nijstad (2003) suggest that groups may feel pressure to achieve premature consensus and tend to focus on common rather than unique and thus non-creative ideas. This tendency could be overcome by ensuring that the group members bring in their different backgrounds. The sharing of multidisciplinary ideas is assumed to stimulate remote associations, which benefits DT, and various problem solving approaches, which benefits CT. In all cases, the outcome might additionally depend on the facilitation of the brainstorm session (Paulus & Nijstad, 2003).

Accordingly, individual´s DT processes should benefit from brainstorming alone in contrast to brainstorming in the group if the task is perceived as novel or complex. For the facilitation of CT processes, it rather seems to depend on the circumstances whether the presence of the group leads to beneficial or limited outcomes.

*The Influence of Distance on Individual Convergent and Divergent Thinking*

The increased use of virtual communication technology gave rise to the question how distance to others influences creativity of the individual compared to creativity in the group (Chamakiotis, Dekoninck & Panteli, 2010; Kiesler & Cummings, 2002).

Recent research suggests that distance in itself can evoke abstract ideas and thus enables individual creativity. The *construal level theory of psychological distance* (CLT) introduced by Trope and Liberman (2010) explains how distance influences individuals' thoughts and behavior. It assumes that the perceived spatial, temporal, and psychological proximity or distance to people or events determine whether they are cognitively processed on a concrete or abstract level of construal. Specifically, as people become psychologically removed from events, their construal of events changes to a higher level (Henderson, Fujita, Trope & Liberman, 2006). These events are then processed in terms of global and essential features. Proximate events appear to be processed on a lower level of construal and are thus represented in a concrete, relatively unstructured, and contextualized way (Henderson, Fujita, Trope & Liberman, 2006). The CLT has been supported in various applied contexts where distance is apparent and seems to show especially intriguing results for creativity research (for a review see Trope, Liberman & Wakslak, 2007).

For *psychological construal*, Polman and Emrich (2011) demonstrated that subjects generated more creative ideas and solved more creative insight problems on behalf of distant others than for close others or for themselves. For *spatial construal*, Jia, Hirt and Karpen (2009) found that it mattered to the subjects' creative performance whether the creative task originated from a far versus a close location. A clear distinction between DT and CT was not explicitly made by the researchers. Yet, the results suggest that for both creative insight tasks, typically used to assess CT, and a creative generation tasks, typically measuring DT (Beersma & De Dreu, 2005), performance improved when their high-level construal was activated by the spatial distance prime. Furthermore, it is assumed that the concepts of perceived physical and psychological distance seem to draw on similar processes (Matthews & Matlock, 2011); social information perceived from spatial distance evoked greater emotional detachedness from the event than when

primed with spatial proximity (Williams & Bargh, 2008). Hence, in cases where subjects perceived the task information (Jia, Hirt & Karpen, 2009) or social event (Williams & Bargh, 2008) from a distance, their individual DT and CT performance increased. Additionally, although not explicitly investigated, Steidle, Werth and Hanke (2011) assume that the mere perceived distance to others led their participants to perform better on creative tasks in darkness than in light, although the task content was unrelated to the other participants. Thus, the construal level theory and associated research suggest that subjects would perform better on DT and CT tasks when working with distance to others.

*The Influence of Distance on Group Convergent and Divergent Thinking*

For interactions where interpersonal collaboration is apparent, research suggests that far distance between group members might benefit DT, while limiting CT. Beersma and De Dreu (2005), Goncalo (2004) and Goncalo and Staw (2006) found that when primed with collectivistic values, groups of participants performed better on CT tasks, whereas when primed with individualistic values, participants performed superior in DT tasks. Collectivistic values (also referred to as pro-social motives) often comprise cooperation, altruism, and harmony, whereas individualistic values (or pro-self-motives) are associated with competition and self-improvement. These social norms are assumed to be culturally dependent (Hofstede, 1980; Markus & Kitayama, 1991), although they might additionally be subject to contextual influences and can be triggered by various instructive or situational primes (De Dreu, Weingart and Kwon, 2000). Since perceived physical and interpersonal closeness is suggested to evoke cooperation and automatic expression of social values (Cornelissen, Dewitte, & Warlop, 2011) and frequent interactions between group members (Latané, Liu, Nowak, Bonevento & Zheng, 1995), spatial closeness could act as a prime for pro-social motives encouraging CT processes

in groups. Spatial distance, on the other hand, could act as a pro-self prime, facilitating DT in groups.

In a different vein of research, Ashton-James and Chartrand (2009) demonstrated that the need for CT or DT processes varies with the social demands; when people were visibly mimicked by others their performance on CT tasks increased, tentatively because being mimicked signals a social opportunity for collaboration and cooperation. However, not being visibly mimicked could have cued DT by signaling a social demand for individual improvisation and innovation. A far distance between people could disable them to identify other people's mimicry which would facilitate DT processes. For successfully facilitating CT in groups, spatial closeness could help clearly detecting the mimicry of others. Finally, the feeling of safety is an important factor in creative and unusual idea generation (West, 2003) and thus in DT. Since the association of psychological safety and distance to others is deeply ingrained in the human brain (Williams & Bargh, 2008), standing far apart from others would profit DT in groups.

Thus, proximity to others could prime pro-social motives that facilitate cohesive and CT in groups. This effect might be additionally supported by the perception of being mimicked, encouraging cooperation and collaboration. On the other hand, the feeling of safety to share unusual ideas could be facilitated by distance to others. This effect might be supported by pro-self motives and the need for innovation and improvisation that arises by distance to others.

In sum, as the reviewed literature shows, groups and individuals influence each other in their activation of CT and DT processes. An important factor that impacts this relation is the physical distance that people have from one another. Physical distance from others could enable individuals to represent events on a high level of construal which should lead to a superior performance in both CT and DT tasks. In group processes, distance to others might furthermore give people a feeling of psychological

safety, allowing to share unusual ideas that help DT. On the other hand, perceived proximity might evoke social-motives that might facilitate feelings of cohesiveness and cooperation enabling CT in groups. The hypotheses of the present study are hence set as follows.

**Hypothesis 1A:** Participants perform better on individual DT tasks when standing far apart from others compared to close to others.

**Hypothesis 1B:** Participants perform better on individual CT tasks when standing far apart from others compared to close to others.

**Hypothesis 2A:** Participants perform better on group DT tasks when standing far apart from others compared to close to others.

**Hypothesis 2B:** Pro-self motives moderate the effect between distance and DT in groups.

**Hypothesis 2C:** Participants perform better on group CT tasks when standing close to others as compared to far away from them.

**Hypothesis 2D:** Pro-social motives moderate the effect between distance and CT in groups.

## Method

### *Participants*

#### *Individuals*

One hundred and thirty-six Dutch participants (56.6% male, 43.4% female, $M_{age}$ = 22.08, age range = 17-33 years) were recruited by the student employment agency StuD in Delft. The recruiting agency had clear instructions to avoid mentioning that the experiment was about creativity as this could have biased the general outcome (Goncalo & Staw, 2006; Bechtoldt et al, 2010). They were additionally asked to exclude

participants who had previously been or were at present enrolled in a creative study such as Design, Architecture, or Fine Arts. Furthermore, they were asked to only recruit participants who would be able to stand for one hour. Participants were compensated with €23.00. One hundred and thirty-one participants (96.3%) indicated to be students, whereas three (2.2%) indicated to be working or job searching. One hundred and twenty-six (92.6%) were enrolled in or held a degree from the Technical University of Delft and ten (7.4%) were enrolled or had graduated from vocational universities. Of all 136 participants, only two had previously been engaged in a psychological experiment.

*Groups*

The 136 participants were compiled into 34 groups of four as suggested by Thompson (2003). Eight of these 34 groups where either only female (N = 2) or only male participants (N = 6), the remaining 26 groups were mixed with at least one male or female participant. The employment agency was explicitly asked to compose groups of people that did not know each other upfront.

*Materials*

Eight equal paper circles (17.5 cm diameter) were attached to the floor to indicate the participant´s standing position, four of them 48.3 cm between the circle centres apart from one another and four of them 365.8 cm apart from one another (see procedure section below). A flip chart with markers was placed either at one of the close or far indications depending on the condition that the respective group started the experiment with (for a schematic overview of the set-up see *Figure 2.1*). Participants were given clipboards with the questionnaires and ballpoint pen to write with. The brainstorm results were typed out by the experimenter on a laptop simultaneously to their production.

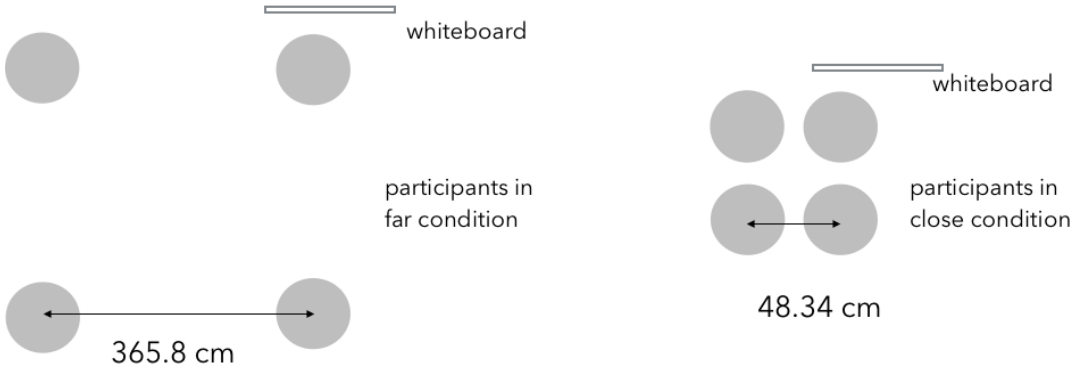


*Figure 2.1*: Left graphic: participants (grey dots) in the far condition with 365.8 cm distance from one another. Right graphic: participants in the close condition with 48.34 cm distance from one another.

*Procedure*

A partial between subject design was administered where the order of tasks (individual and group DT and individual and group CT) and distances (close and far) were counterbalanced between groups (see Appendix A for an overview of the testing sequences). The experiment took place at the building of Delftstede in Delft and lasted approximately one hour to complete. Participants in groups of four were led into the room, welcomed, and given the informed consent to sign. Age, sex and profession were assessed thereafter. Then participants were assigned to stand on one of the paper cycles each and remain standing until the end of the experiment as this was hoped to achieve higher cognitive activation and arousal in participants compared to other body postures (Lipnicki & Byrne, 2005). Close distance was set due to subjectively perceived comfortable distance to strangers which usually depends on the interaction partner´s cultural background and is 19.03 inches (48.3 cm) on average in the Netherlands (Sommer & Becker, 1969). Furthermore, Alessandra and Hunsaker (1993) suggest the furthest of all interpersonal spaces to be the public space starting from 12 feet (365.8 cm). Since ecological comparability with brainstorm settings was hoped to be achieved, this and no farther distance was considered and taken for the far distance condition. The order of tasks and distances were counterbalanced between groups; Distance between

participants was changed once (close; close; far; far or far; far; close; close) or three times (close; far; close; far or far; close; far; close) while performing the individual and group DT tasks and thereafter the individual and group CT tasks leading to 16 different variations of experimental testing sequences (Appendix A [Figure 2.2], see Appendix B for pictures [Figure 2.3, Figure 2.4]).

Participants were told that they were taking part in a study of how groups interact to search and find solutions to a given problem (Dutch: "oplossingen zoeken en vinden"). It was carefully avoided to mention words related to "creativity" throughout the whole experiment (Goncalo & Staw, 2006; Bechtoldt et al, 2010). Instructions for all tests were read out to the groups in Dutch, while participants could simultaneously read along. All of the four tests were accomplished by the groups, starting with either the individual or group DT task, followed by the individual or group CT task as suggested by Cropley (2006). For the Group DT task, groups were instructed to brainstorm and results were recorded on the flip chart by one randomly assigned group member while the experimenter typed them out instantaneously. For the group CT, participants first silently walked to the flip chart to reread all results, then they returned to their assigned standing positions and thereafter the group agreed on a solution. Both individual DT and CT tasks were completed silently and individually. After all four tests were completed, the Decomposed Game (see below) to assess the moderating effect of social value orientation was handed to the participants while instructed to stay in the previously assigned distance position. Thereafter, participants were debriefed and released.

*Measures*

Individual DT was measured with the Alternative Uses Task (AUT) in which

participants are asked to generate as many ideas as possible for simple household objects like e.g. a brick within ten minutes (Guilford, 1967). Because a brick is a well-known example for the AUT, more uncommon but previously used household objects, namely a shoe, a newspaper, and a coat hanger were taken (Hommel et al., 2011; Smith & Whitney, 1987). The generated ideas were then scored on the four DT subscales, fluency, flexibility, originality, and elaboration. For *fluency,* the sheer number of the generated nonredundant ideas was taken as score. For *flexibility*, two independent raters with a creative professional background (Amabile, 1996) defined categories independently that they later agreed upon. Each individual idea was then assigned to a category by the raters independently and the sum score of the categories per participant was taken as flexibility score. Raters agreed upon the number of categories with a high interrater reliability computed with Cronbach's alpha (Cronbach, 1951) ($\alpha$ = .925 for shoe, $\alpha$ = .893 for newspaper, $\alpha$ = .932 for coat hanger) and thus their scores were averaged (Tavakol & Dennick, 2011). For *originality*, the raters evaluated each idea on how original they found the idea on a five-point scale (1 – not at all creative, 5 – very creative). They were asked to take into account how frequent a response was mentioned compared to the total number of responses from all of the subjects; that is, a subjectively rated highly creative idea would get a low score if named by many other participants (Runco & Mraz, 1992). Raters agreed upon the originality rating with a high interrater reliability ($\alpha$ = .780 for shoe, $\alpha$ = .974 for newspaper, $\alpha$ = .977 for coat hanger) and thus their scores were averaged. For *elaboration*, a score was given on the basis of Colzato et al's (2012) suggestion to evaluate the amount of details given by allotting zero points to only naming the alternative usage, one point for introducing the context it is used in, and two points for providing further details (Plucker & Makel, 2010). Cronbach's alpha was calculated to determine comparability between raters for

all four DT subscales ($\alpha$ =.827 for fluency, $\alpha$ =.611 for flexibility, $\alpha$ =.807 for originality and $\alpha$ =.642 for elaboration), and four composites were computed.

Individual CT was assessed with the Dutch 22-item short version of the Remote Association Task (RAT) (original by Mednick, 1962) developed by Chermahini, Hickendorff and Hommel (2012). The RAT presents participants with three concepts per item, e.g., "cottage", "Swiss", "cake", that need to be associated with one correct concept that they are all commonly related to (in the example, "cheese" is the correct answer). The absolute number of well solved RAT items was taken as individual CT score.

Group DT was assessed as suggested by Goncalo (2005) and Goncalo and Staw (2006) where participants are presented with the following scenario.

> "After years of mismanagement and poor quality food, the restaurant of a major West Coast University has gone bankrupt and is being shut down. The school administration is trying to decide what new business should go into that space. You have fifteen minutes to come up with as many solutions to the problem as possible"

Since Bechtoldt et al. (2010) propose to use a scenario that is involving to the subject population, a Dutch University, the Utrecht University, was taken as venue for the story and the scenario was translated to Dutch (see Appendix C). Results of the brainstorm were rated by the two raters in an equal fashion as it has been done for flexibility originality and elaboration in the AUT (see above). Raters agreed on originality scores with an $\alpha$ = .982 and a composite was computed. They did not sufficiently agree on elaboration scores ($\alpha$ = 0.166) thus elaboration was excluded from further calculation. For fluency, the sheer number of nonredundant ideas generated was taken as score.

Cronbach's alpha was rather low for flexibility ($\alpha$ = .574) and testing assumptions for conducting t-tests revealed a significant value in Shapiro-Wilk Test for flexibility. Therefore, flexibility was dismissed from further calculations, too.

In order to assess group CT, groups were asked to select the best solution of their brainstormed ideas from the DT task within 10 minutes (Goncalo & Staw, 2006). It was asked for the "best" and not "most creative" solution, because Goncalo and Staw (2006) found that pro-self groups would outperform pro-social groups when instructed to be creative which could possibly bias the outcome in the present experiment. Following previous research (Guildford, 1956; Larey & Paulus, 1999; Goncalo & Staw, 2006), CT was measured in terms of flexibility where a lower score of flexibility meant a higher score in CT. Therefore, the raters were instructed to categorize all ideas generated in the entire sample and to count the number of ideas generated within each category. Each idea then received a score equal to the number of times an idea category appeared in the sample, e.g. if there were 22 restaurant ideas in the whole sample, each restaurant idea would receive 22 as score. (Goncalo and Staw, 2006). Furthermore, subjective originality of the solution was rated on a five-point scale (1 = very uncreative, 5 = extremely creative) (Goncalo and Staw, 2006) and appropriateness was measured on a five-point scale (1 = not feasible at all, 5 very feasible) by the raters (Amabile, 1996; Bechtoldt et al., 2010). Raters agreed sufficiently on flexibility ($\alpha$ = .807) and originality ($\alpha$ =.842) and consequently their scores were averaged together. However, interrater reliability was too low to compute a composite of appropriateness ($\alpha$ = .469). Therefore, the variable was dismissed from further calculation.

Decomposed Game is suggested to reliably assess pro-social value orientation by requiring subjects to theoretically distribute different amounts of money between

themselves and others (Liebrand & Van Run, 1985). Thus, the well validated nine-item version by Van Lange et al (1997) was used. The English and Dutch versions of the whole questionnaire can be found in Appendix C.

## Results

### *Individual Results*

#### *Description of Multilevel Modelling*

In the present study, individual data were assessed while subjects were in groups of four. It is suggested that in creativity research, the outcomes of participants within one group might be influenced by the outcomes of group members in this group. (Drazin, Glynn & Kazanjian, 1999; Woodman, Sawyer & Griffin, 1993). Therefore, the fundamental assumption of independence of observations required to use ordinary least-squares (OLS) techniques is violated and consequently a multilevel analysis is applied (Field, 2009; Nezlek, 2008). In a multilevel model, it is assumed that data of one level of analysis (level I, individuals) are nested within data of a higher hierarchy level of analysis (level II, Groups). More precisely, for each level II group a level I model is assumed which is functionally equal to a regular regression formula (equation 1). The intercept ($\beta_{0j}$) of the level I regression equation indicates the level II group influence (equation 2) on a level I relationship described by the slope ($\beta_{1j}$) (Nezlek, 2008).

Level I model: $Y_{ij} = \beta_{0j} + \beta_{1j} + r_{ij}$ *Equation 1*.

Level II model: $\beta_{0j} = \beta_{00} + u_{0j}$ *Equation 2*.

*Equation 1*. '*i*' Level I individual observations are nested within '*j*' Level II groups of a continuous dependent variable *Y*. They are modelled as a function of the intercept for each Level II group *'j'*($\beta_{0j}$), the slope ($\beta_{1j}$, the relationship in groups *'j'* between Level I predictor and outcome *Y*), and the error ($r_{ij}$, the individual difference around the group mean). *Equation 2:* $\beta_{00}$ is the overall intercept (grand mean of scores in outcomes across all groups when all predictors are zero). $u_{0j}$ is the overall error for the variance of intercepts of one group from the overall intercept (Nezlek, 2008; Peugh, 2010).

In multilevel modelling, it is possible to examine the effect of random coefficients on the model fit. In OLS techniques, it is usually assumed that parameters are fixed, meaning that they cannot vary over situations or contexts. The rationale behind random effects however is that model parameters are free to vary over situations or contexts, thus effects can be generalized beyond the treatment condition in an experiment. By allowing intercepts to be random, the extent to which the groups might have an influence on the individual outcome can be examined. A random slope furthermore indicates the extent to which groups differ in the relationship between predictor and outcome (Field, 2009). However, because the group level functioned as a predictor itself, it was not logical to take the random slopes into account for the present analysis. Multilevel model analysis was applied to fluency, originality, and elaboration in the AUT, and the RAT score- leading to four models that are described below. For flexibility in the AUT, intraclass correlation coefficients (ICCs) were zero thus a multilevel model could not be computed (Peugh, 2010) and an ANOVA was administered.

*Individual Divergent Thinking (AUT)*

The descriptives of the four DT subscales (**Table 3.1**) and their mutual correlations (**Table 3.2**) can be found in the tables below. The correlation matrix revealed significant correlations between fluency, flexibility, and originality and non-significant correlations with elaboration.

All multilevel models were built up following the same structure; On the first level, distance in the AUT condition was added to the model as predictor variable and on the second level, the group membership was added.

| | *M/SD* | *M/SD* close condition | *M/SD* far condition |
|---|---|---|---|
| Fluency | *M* = 9.203<br>*SD* = 3.199 | *M* = 8.833<br>*SD* = 2.989 | *M* = 9.574<br>*SD* = 3.377 |
| Flexibility | *M* = 3.522<br>*SD* = 0.637 | *M* = 3.412<br>*SD* = 0.597 | *M* = 3.632<br>*SD* = 0.661 |
| Originality | *M* = 23.754<br>*SD* = 9.756 | *M* = 22.650<br>*SD* = 9.369 | *M* = 24.858<br>*SD* = 10.076 |
| Elaboration | *M* = 1.0098<br>*SD* = 1.028 | *M* = 1.074<br>*SD* = 1.048 | *M* = 0.946<br>*SD* = 1.012 |

**Table 3.1.** Descriptive statistics of the four DT subscales

| | Fluency | Flexibility | Originality | Elaboration |
|---|---|---|---|---|
| Fluency | 1 | .717** | .951** | -.096 |
| Flexibility | .717** | 1 | .674** | -.012 |
| Originality | .951** | .674** | 1 | -.051 |
| Elaboration | -.096 | -.012 | -.051 | 1 |

**Table 3.2.** Pearson correlations for all DT subscales. ** = $p < .01$.

As for fluency, a non-significant effect of distance on fluency ($F(1, 136) = 1.859, p = .175$) was found. Allowing the intercept to vary did not improve the model significantly (Var (u0j) = 0.511, $\chi^2$ (1) = 0.498, $p > .05$). Thus, the relationship between distance and AUT Fluency did not show significant variance in intercepts across participants. The groups did not have a meaningful influence on the fluency outcome of the individuals ($F(1, 34) = 997.048, p = .510$). For originality, a non-significant effect of distance on originality was found ($F(1, 136) = 1.778, p = .185$). Allowing the intercept to vary did not improve the model significantly (Var (u0j) = 6.3057, $\chi^2$ (1) = 0.861, $p > .05$), thus groups did not have a significant impact on the originality outcome of the individuals ($F(1, 34) = 684.087, p = .397$). For elaboration, a non-significant effect of distance on elaboration was found ($F(1, 136) = 0.529, p = .468$). Random intercept did

not improve the model significantly (Var (u0j) = 0.0144, $\chi^2$ (1) = 0.038, $p > .05$). Groups did not impact the individual elaboration significantly ($F(1, 34) = 127.469$, $p = .849$). To calculate the effect of distance on flexibility, a one-way ANOVA was used revealing a significant impact of distance on fluency ($F(1, 134) = 4.170$, $p = .043$, $\eta^2 = .030$). Participants standing far apart from one another generated ideas across significantly more categories ($M = 3.63$, $SD = 0.661$) than those standing close together ($M = 3.41$, $SD = 0.597$).

For the individual DT results, it can be concluded that there was a non-significant difference between subjects standing far apart to those standing close to the other group members in generating ideas. Results were non-significantly more original in those individuals standing far apart than those standing close together. No significant impact of distance could be found for elaboration either. For flexibility, individuals standing far from others generated ideas that crossed significantly more categories than those standing close together. In none of the DT subscale results did group membership impact individual results significantly.

*Individual Convergent Thinking (RAT)*

For the RAT, a non-significant effect of distance on the RAT score was found ($F(1, 135) = 2.733$, $p = .101$). Allowing the intercept to vary did not improve the model significantly (Var (u0j) = 1.568, $\chi^2$ (1) = 0.124, $p > .05$), thus groups did not have a significant impact on the individual RAT score ($F(1, 34) = 1384.078$, $p = .785$). Individuals solved more items on the RAT when standing close to others ($M = 9.71$, $SD = 3.052$) rather than far apart from others ($M = 8.91$, $SD = 2.634$). This differences was not significant. Groups did not impact individual results significantly.

*Group Results*

*Moderator Decomposed Game*

On the basis of the Decomposed Game, 60% of all participants were categorized as collectivistic orientated, 20.6% were individualistic orientated and 19.4% could not be categorized. Intraclass correlation coefficients (ICCs) were 0.043. The ICCs estimate the variance in an individual response that is be explained by the group membership or the degree to which a measure varies between as opposed to within groups (Castro, 2002; see also Hox, 2002). As such, the value for Decomposed Game is considered very small (Cicchetti, 1994), meaning that the groups had hardly any impact on the individual's classification of being pro-socially or pro-self motivated. A moderator analysis could therefore not be executed.

*Group Divergent Thinking (Brainstorm)*

Fluency and originality were normally distributed as non-significant Shapiro-Wilk tests showed and there was homogeneity of variances as assessed by the Levene's Test. A correlation between the two constructs revealed a significant positive correlation ($r = .988, p = .000$). Two independent sample t-tests were conducted to identify the influence of distance on fluency and originality. For fluency, groups standing close together generated on average more ideas ($M = 48.63, SD = 11.456$) than those standing far apart ($M = 44.27, SD = 11.417$). This difference was non-significant ($t(30.241) = .014, p = .278$). For originality, it was found that on average, groups came up with more original ideas when standing close together ($M = 139.47, SD = 37.428$) than did those standing far apart ($M = 126.2, SD = 36.865$), but this difference did not reach significance ($t(30.399) = .016, p = .309$). As none of these independent sample t-tests reached significance, the hypothesis 2A - Participants performing better on group DT tasks when far apart from others compared to close to others – can be rejected.

*Group Convergent Thinking (Solution Finding)*

A correlation between flexibility and originality revealed a non-significant negative correlation between the constructs ($r$ = -.327, $p$ = .059). Inspection of Q-Q Plots revealed originality and flexibility to be normally distributed and there was homogeneity of variance as assessed by the Levene's Test. Therefore, two independent sample t-tests were conducted to identify the influence of distance on flexibility and originality of the group's solutions. For flexibility, solutions of groups standing close together were divided over less categories ($M$ = 13.41, $SD$ = 8.016) than solutions of those standing far apart ($M$ = 15.94, $SD$ = 8.518) and were thus more convergent. This difference was not significant ($t$(31.883) = 0.421, $p$ = .379). For originality, the t-test revealed that the ideas of groups standing close together were rated as more creative ($M$ = 2.94, $SD$ = 1.298) than of those groups standing far apart ($M$ = 2.35, SD = .996). The t-test did not reach significance ($t$(29.999) = 1.192, $p$ = .148). To conclude, as none of the independent sample t-tests reached significance, hypothesis 2C - Participants perform better on group CT tasks when standing close to others as compared to far away from them – can be rejected.

## Discussion

The aim of the present study was to find whether close versus far spatial distance between group members impacts DT and CT production in different ways for individuals and groups. More specifically, for individual DT and CT, it was hypothesized that far distance to others would improve creative performance as compared to close distance. For group creativity, distance between group members was proposed to benefit DT, while limiting CT. Pro-social and pro-self motives were proposed to moderate this effect.

Results partially supported hypothesis 1A in the sense that as people stand far apart from rather than close to others, their individual brainstorm results cross significantly more categories and are thus more flexible. No significant results could be obtained for the other individual DT subscales. Furthermore, no significant difference between the close and far conditions could be found for the outcome of the RAT measuring individual CT. However, the numerical difference between close and far was opposed to the hypothesized direction. There were no significant effects of distance on the group brainstorm (DT) and group solution finding (CT), either. The moderator analysis could not be executed as groups did not impact the individual classification for pro-social or pro-self motives reliably.

*Individual Divergent Thinking – A Dual-Path Model Explanation?*

The findings support research by Chermahini and Hommel (2010, 2012) and Beersma and De Dreu (2005) proposing that individual creativity is not a homogeneous concept and its DT and CT processes are influenced by contexts in different ways. What is more, it also supports the suggestion by Rietzschel, De Dreu and Nijstad (2009) that different concepts of DT can be affected to a different extent by the same variables.

As such, flexibility was significantly improved in subjects who stood apart from another. Generally, flexibility is said to be the most reliable of all DT categories (Chermahini & Hommel, 2010) and extremely important for the predictive validity of DT tests (Runco & Okuda, 1991). It is therefore interesting that this effect did not significantly transfer to fluency, originality and elaboration. Rietzschel, De Dreu and Nijstad (2009) offer an explanation by proposing *a dual pathway model for divergent thinking* where flexibility and persistence, enabling fluency and originality, are facilitated through two separate cognitive routes that are affected by environmental conditions and personality traits independently (Figure 4.1). It is for example assumed

that contexts or traits discouraging rigidity might increase flexibility while fluency or originality of an outcome stay unaffected.

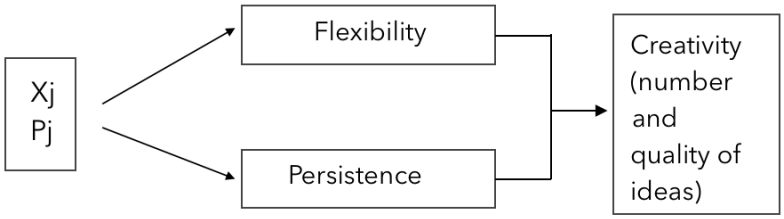


*Figure 4.1:* Dual pathway model for DT. The persistence route is manifested in fluency and originality scores. Contexts ($X_j$) and traits ($P_j$) influence both routes.

It is possible that standing far from others was perceived as less constraining than standing close to others, improving flexibility but neither fluency nor originality. So far, support for the dual-pathway model has only been obtained on an individual level. The authors nevertheless assume that it could appear in group contexts, too (Rietzschel, De Dreu & Nijstad, 2009).

Elaboration did not correlate with any of the other DT subscales, suggesting that it did not assess DT as well as originality, flexibility, and fluency did. Elaboration is generally said to be one of the least common DT subscales (Runco & Acar, 2012) and is ignored frequently by creativity researchers, possibly because it is not as reliable as the other DT subscales. It does seem logical that within a given time constraint, people who are highly fluent in their idea generation would not take out much time to elaborate on these ideas. This could be one possible reason for elaboration to score independently from originality, flexibility, and fluency.

*Individual Divergent and Convergent Thinking in Presence of an Audience*

The findings did not support the construal level theory, because prior associated research found that a higher level of construal was evoked by the far distance prime for brainstorm tasks (DT) and creative problem solving (CT tasks) in an equal fashion (e.g. Förster, Friedman & Liberman, 2004; Jia, Hirt & Karpen, 2009). Although the

hypothesis could partially be confirmed for DT tasks, CT results were in opposed direction to the notion of the construal level theory.

An alternative and more likely explanation for the individual creativity outcomes stems from the social facilitation effect where individuals perform better on easy well-learned tasks in the presence of others but worse on hard and ill-learned ones. A simple reason for the diverse effect of distance on DT and CT would be that for technical students, solving rather analytic problems (RAT) should be better learned than solving creative problems (AUT), thus close presence of others should improve analytical thinking and hinder creative thinking (Street, 1974).

A less straightforward reasoning comes from the theories on possible enablers of social facilitation. Zajonc (1965) initially proposed that presence of others increases individual's arousal which stimulates predominant responses at the expense of secondary ones. Therefore, if dominant responses are correct, performance should be improved (Amabile, 1996). This theory was challenged by e.g. Carver and Scheier (1980) who submitted a self-attention control hypothesis where the audience facilitates behavior simply by reminding subjects of themselves which would increase their concentration. This idea was expanded on by Huguet et al. (1999) in their attention-focusing perspective. According to this approach, the presence of others narrows individuals' attentional focus leading to improvement on simple tasks, here defined by a small number of relevant task cues. Consequently, complex tasks would require attention in a wide range of cues thus inhibiting performance in the presence of others. Since CT is dominated by a focused cognitive control state characterized by strong top-down processes (Colzato, Szapora & Hommel, 2012; Hommel, 2012), a focused attention induced by the close presence of others could have benefited CT, however non-significantly, while having limited DT.

In this respect, a limitation of the study was the interaction of individuals in the group DT task, because it could have impacted the subsequent individual CT assignment. Kiesler and Cummings (2002) note that in studies where social facilitation effects are researched, examiners carefully have to prevent subjects from talking with each other as already brief communication could outbalance social facilitation. This could potentially explain the non-significant results for CT opposed to DT.

Since the mechanisms behind social facilitation are still not finally agreed upon (Paulus, 2015) the explanation offered above can only remain speculative. Future research targeted to explore social facilitation with impact on individual DT and CT in different professions can be fruitful.

*Group Creativity*

As for group creativity, results coherently did not reach significance for any of the measured subscales. Spatial distance of a few meters between people did not seem to affect groups' CT and DT in a meaningful way. This supports associated research insights by Goncalo and Staw (2006) suggesting that crucially different mechanisms might be active in interacting as opposed to non-interacting groups. Since incomparable assignments were given to individuals and groups, a valid comparison can ultimately not be drawn here. The nonsignificant results could additionally hint at several limitations of the survey that are mentioned and discussed below.

*In-Group Norms*

Groups did not impact their individual group members' individualistic and collectivistic categorization reliably and a possible moderator effect of the relationship between distance and creative outcomes could not be examined. Interestingly, however, almost 60.0% of all participants were categorized as collectivistic whereas only 20.6% indicated to have individualistic motives. Some, but not all groups, where compiled of mostly collectivistic oriented group members. This is rather untypical for the Dutch

population where the majority of people is assumed to hold culturally dependent individualistic norms (Hofstede, 1980; Bechtoldt, De Dreu, Nijstad & Choi, 2010).

An initial explanation for this observation comes from the fact that social value orientation was assessed at the end of the experiment and a successful group brainstorm, rather than the distance between group members, could have primed pro-social motives.

In a different vein, it is possible that by instructing to work as a group and by the knowledge of other competing groups being present in the experiment, a majority of the participants could have formed an *in-group identity*. This construct is proposed by the *social identity approach* (Tajfel & Turner, 1979) according to which members strive to facilitate optimal performance of their group due to their personal identification with it. An in-group identity and the thereby activated collectivistic values were previously found to facilitate various advantages for CT in groups; Group members tend to recognise creative ideas over uncreative ones of their team colleagues better (Adarves-Yorno, Postmes & Alexander Haslam, 2006) and understand and consider others perspectives (Grant & Berry, 2011) if an in-group identity is salient. Importantly, moderate in-group bias was suggested to elevate the cooperation and cohesion level in group members (Tang, Wang, Li, 2014) which could help to agree on a solution.

Nevertheless, in some groups, one or two participants indicated to hold individualistic motives. Those groups could have been exposed to their majority opinion which is suggested to enhance DT in groups (Nemeth & Kwan, 1987). Thus, some groups could have performed superior on the DT task while for others convergent production possibly excelled.

There is a need to investigate why in certain group situations like the present one, pro-social motives were activated in some but not all group members, because a guided facilitation of pro-social value enhances CT, while a stimulation of pro-self-orientation enhances DT in groups. If an in-group identity enabled by the task

instructions and the context indeed accounted for the increased pro-social motive categorization, future group creativity researchers should consider this methodological problem.

*Limitations Reflected in Group Outcomes*

The non-significant results for DT and CT in groups hint towards possible limitations of the survey. Firstly, the distance between participants might not have been large enough to find meaningful effects in the interacting groups. The distance was originally set due to ecological comparability of brainstorm settings. However, according to Allen (1977), the first major response to distance occurs when people become more than 30 meters removed from each other. Kiesler and Cummings (2002) furthermore suggest that an abstract representation of the interaction partner will only be achieved if the other is even geographically dislocated. Additionally, people are suggested to counterbalance small spatial and thereby social distance by using communicational strategies such as increased eye gaze (IJzerman & Semin, 2010). A shared environmental setting, regardless of the actual distance between people, seems to be sufficient to sense crucial communication information of others (Kraut, Fussell, Brennan & Siegel, 2002). In that sense, the close versus far group condition might not have been all that different from another to find meaningful effects. Results can therefore not be compared to situations of remote working where others cannot be seen or talked to easily. However, in many applied brainstorm settings, it is still common practise to collaborate in the same physical space (www.rws.nl/lef-future-center/). The present experimental set-up is therefore relevant for those situations.

Secondly, a rather homogeneous sample was employed, comprising mostly technical students from the Technical University of Delft who were all Dutch. The diversity of members in a group is said to have an impact on the group dynamics which impact creativity in meaningful ways. Positive side effects of homogeneous groups are

satisfaction and identifying with the group which might encourage to agree on a solution (Milliken, Bartel & Kurtzberg, 2003). In the present sample, this skill might have been especially developed as project work in teams is strongly encouraged and trained by the TU Delft (www.tudelft.nl/en/study). Additionally, people tend to generate more ideas in ethnically homogeneous groups presumably because they are more interested in ideas of others and dare to share unusual ones (Baruah & Paulus, 2009). If distance would in any case be impactful on group creativity, groups in the present survey may have possibly overcome it due to their homogeneity and their routines in solution finding processes. Importantly, the homogeneous student sample is unrepresentative for interdisciplinary project teams compiled to develop creative solutions in a real-world setting (Mamykina, Candy & Edmonds, 2002) leading to limited generalizability of the present outcomes.

*General Limitations*

As for individual creativity, it is important to consider whether the compensation of €23 could have impacted individuals' DT and CT production. According to Frey (1999), reward in any form reduces creativity as people are only stimulate to work harder and produce a lot at the expense of the outcome quality. Baer et al. (2003) suggest that the relationship is not all that simple and propose that the relation between reward and creativity depends on employee's cognitive styles and task difficulty. They found that monetary incentives even improved creative production if employees had an adaptive cognitive style and worked on relatively simple tasks. They found a weak influence of reward when employees with an innovative cognitive style worked on complex tasks. Consequently, it could well be that the monetary compensation influenced the DT and CT outcome for some but not all individuals.

As for group creativity, no well validated assessment tool is yet available to creativity researchers and thus a previously used brainstorm and problem solving task

was employed which could have led to several limitations. Firstly, instructions appeared to be unclear on the role of the groups as problem solvers. For example, participants mentioned to be unsure about whether they should find a solution as school administration or apply the external view of a consultancy. The groups' role interpretation may have subsequently impacted their decision. Furthermore, the randomly assigned writer of all brainstorm results might have functioned as a preliminary idea filter, because the number of ideas collected depended on whether he or she would consider the ideas as suitable. This limitation may have subsequently impacted the group DT fluency score. Lastly, the presentation of the problem may have been too multifarious for the groups to solve. Baruah and Paulus (2009) suggest that when groups are confronted with a too complex problem that offers at least 20 idea categories, as it was the case in the present experiment, they tend to avoid making decisions. They propose that presenting one aspect of a problem at a time rather than the whole problem at once should facilitate brainstorm as well as solution finding. Importantly, there is an immense need for the development of a validated measurement tool that assesses group DT and CT while accounting for the limitations specified above.

## Implications

### *Theoretical Implication and Future Research*

No support for the construal level theory could be obtained for individual creativity and consequently, the effect of spatial distance on high level of construal seems to be restricted to how far the task rather than others unrelated to this task are removed. For group creativity, however, promising research by Wilson, Crisp and Mortensen (2013) suggests that in interaction with dislocated others, a higher level of construal could well be activated which might have interesting impacts on group creativity. As remote working is increasingly popular in the 21$^{st}$ century (Hardill &

Green, 2003) follow up research should focus on the effects of spatial dispersion between group members on their creativity. In the context of social facilitation, it might be thrilling to investigate how merely present others could impact individual DT and CT in a strictly non-interactive setting. Important implications for the methodology of creativity research could be that the presence of an experimenter or other participants during DT experiments might have to be overthought. Lastly, a clear need is shown for the development of a well validated group creativity assessment tool.

*Implications for Organizational Innovation*

This survey was conducted on behalf of the LEF future centre in Utrecht. LEF is a sub department of the Dutch ministry of infrastructure where group work of employees and their business partners is facilitated on the basis of scientific insights. Applied research conducted at LEF is therefore targeted to improve group dynamics, innovative decision making processes and creativity in realistic team setting. Insights of the present study will therefore directly be used to improve the facilitators' work at LEF.

For individual creativity, the flexibility of ideas during an individual brainstorm should excel if people are standing at a distance from each other that resembles a public space (starting from 356 cm). Practical implications could be to consider the interior table arrangement of offices, where individual brainstorm is to be improved. Another implication could be to encourage employees to find personal space when brainstorming alone. Since the sample in this experiment was rather homogeneous and mostly containing Dutch participants with a technical background, the suggestions are ultimately restricted to comparable employees. For group creativity, unfortunately no clear suggestions can be given.

## Conclusion

The present research investigated whether interpersonal distance impacts individual and group creativity. Distance to others of about three and half a meter rather than less than half a meter showed to improve individual flexibility, a sub-dimension of DT. This result invites options for improving organizational creativity by e.g. simply adjusting office interior to improve individual DT. Results furthermore suggest that this relation might be possibly reversed for individual CT. In this concern, follow-up research should investigate whether the mere presence of others impacts individual DT and CT. No results could be found for group creativity and the need for the development of a well validated group creativity assessment tool is shown.

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# Appendix A

The different randomization conditions are shown in the schematic graphic below.

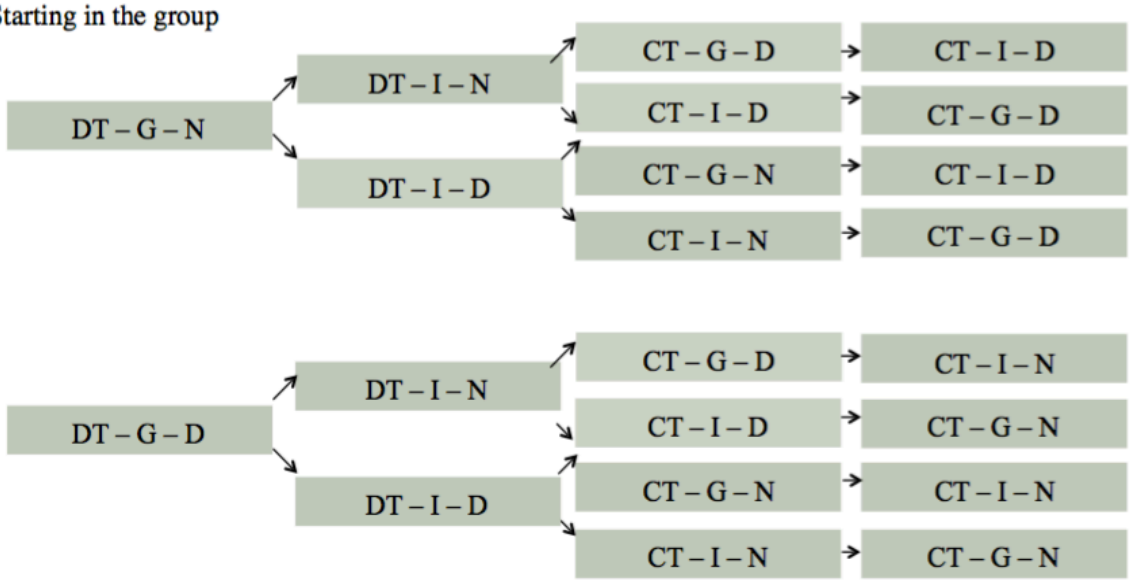
Factor 1: DT = Divergent Thinking, CT = Convergent Thinking

Factor 2: G = Group, I = Individual

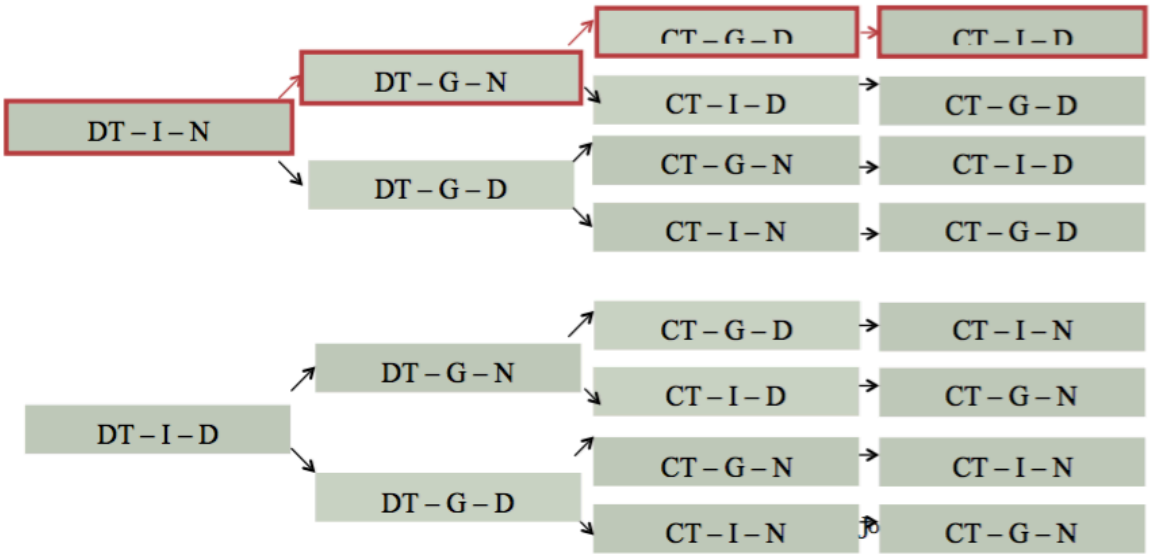
Factor 3: N = Near, D = Distant

Example: One group of four people might start by standing close to each other and filling in the individual DT assignment. In a next step, they stay close but complete the DT group task and furthermore continue with the CT task on a group level having changed there position to standing apart from each other. Lastly, they complete the CT individual assignment by staying in there far away position (this example is indicated in red).

Starting in the group




Starting individually with the group present



## Appendix B

*Figure 2.3*: Photograph of participants in far condition solving the RAT.

*Figure 2.4*: Photograph of participants in close condition solving the convergent thinking group task (finding a solution to the cantine problem).

Appendix C

# Oplossingen zoeken en vinden

Groepscode: ___ _____ > _____ > _____ > _____

Groepsnaam: _____

Proefpersoon code:

| Proefpersoon nummer? | Groepsnaam? | Eerste letter van uw geboortestad? | Mannelijk of vrouwelijk? (schrijf **m** of **v**) | Laatste twee getallen van uw geboortejaar? |
|---|---|---|---|---|
| | | | | |

## Voorvragenlijstje

Opleidingsniveau: MBO [ ] HBO [ ] WO [ ] andere _____

Beroep: _____

Leeftijd: _____

Geslacht? mannelijk [ ] vrouwelijke [ ]

Instructie:

1. Bij het testen krijgt u een plek toegewezen. Het is belangrijk dat u op uw plek blijft staan totdat u een nieuwe plek krijg toegewezen.

2. Er worden toetsen afgenomen die individueel of in groepsverband beantwoord moeten worden.

3. Er bestaan geen foute antwoorden. We moedigen *iedereen* expliciet aan om aan de toetsen deel te nemen.

4. Vragen kunnen aan het eind van het experiment gesteld worden.

Rijkswaterstaat
Ministry of Infrastructure and the Environment

# Remote Associ ation Task

Universiteit Leiden

Gelieve deze toets alleen te maken dus zonder hulp van andere deelnemers. Hieronder staan 22 problemen beschreven die elk bestaan uit drie woorden. Bedenk voor ieder probleem een woord dat aan de andere woorden toegevoegd kan worden, zodat het een nieuw woord vormt (Bijvoorbeeld PALM / STAM / HUT zijn allemaal gerelateerd aan het woord BOOM: PALMBOOM, STAMBOOM EN BOOMHUT). U kunt uw antwoorden op de lijntjes naast ieder probleem schrijven. U heeft 15 minuten om deze opdracht te maken.

1. Bar / jurk / glas: _____
2. Kaas / land / huis: _____
3. Vlokken / ketting / pet _____
4. Val / meloen / lelie _____
5. Vis / mijn / geel _____
6. Achter / kruk / mat _____
7. Worm / kast / legger _____
8. Water / schoorsteen / lucht _____
9. Trommel / beleg / mes _____
10. Hond / druk / band _____
11. Controle / plaats / gewicht _____
12. Goot / kool / bak _____
13. Kolen / land / schacht _____
14. Schommel / klap / rol _____
15. Kamer / masker / explosie _____
16. Nacht / vet / licht _____
17. Arm / velt / stil _____
18. Olie / pak / meester _____
19. School / ontbijt / spel _____
20. Deur / werk / kamer _____
21. Strijkijzer / schip / trein _____
22. Man / lijm / ster _____

# Alternative Uses Task

Gelieve deze toets individueel te maken, dus zonder hulp van andere deelnemers.

Schrijf zoveel mogelijk toepassingen op voor 3 algemene huishoudelijke artikelen. U krijgt 10 minuten voor deze opdracht (dus circa 3 minuten per huishoudelijk artikel). Let op, er zijn twee pagina's voor deze opdracht!

Voorbeeld: **een baksteen** kan worden gebruikt als een presse-papier, een deurstopper, wapen, bloempot, etc…

SCHOEN

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

*Ga verder met de opdrachten op de volgende pagina.*

KRANT

JASHANGER

Rijkswaterstaat
*Ministry of Infrastructure and the Environment*

Universiteit Leiden

## Oplossingen zoeken

U gaat nu een opdracht met de groep uitvoeren. Bedenk zoveel mogelijk oplossingen voor het hieronder beschreven probleem.

De persoon die de letter B op het antwoordblad heeft staan krijgt bovendien de taak alle genoemde antwoorden op het whiteboard te schrijven. Deze persoon dient ook actief mee te doen aan de brainstorm.

Het doel van deze opdracht is om met zoveel mogelijk oplossingen te komen. Het is niet de bedoeling om maar één oplossing naar voren te brengen. Er zijn geen foute antwoorden mogelijk.

Lees nu rustig het probleem door:

***Het Kantine Probleem***

*“Jaren van mismanagement en slechte voedselkwaliteit hebben geleid tot het faillissement van de kantine van de Universiteit Utrecht. De kantine zal binnenkort hun deuren moeten sluiten. Het universiteitsbestuur moet een besluit nemen hoe de ruimte alternatief in gebruik genomen zal worden.”*

U heeft tien minuten om met zoveel mogelijk oplossingen te komen.

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## Oplossingen vinden

Ga nu rustig naar het whiteboard en lees nog eens de ideeën door die u en de groep tijdens het brainstormen hebben gevonden. Het mag hiervoor niet met de groepsgenoten gesproken worden. Ga nu terug op de aan u toegewezen plek.

U gaat nu weer een opdracht met de groep uitvoeren. Neem de genoemde oplossingen voor het ‘Kantine Probleem’ door en kies met de groep de beste oplossing. U heeft hiervoor 10 minuten tijd.

De persoon die de letter S op het antwoordblad heeft staan krijgt bovendien de taak de gekozen oplossing in naam van de groep op zijn/haar antwoordlijstje te schrijven.

Oplossing:

_____

_____

_____

_____

# Laatste Opdracht

U bent nu bijna klaar! Dit is de laatste opdracht die uw volle concentratie vereist. Lees alstublieft de instructies aandachtig door en voltooi de opdracht individueel, zonder te praten met de andere deelnemers. U mag hierbij gaan zitten. Let op, er zijn twee pagina voor deze opdracht!

In deze opdracht vragen we u om zich voor te stellen dat u willekeurig in een tweetal bent geplaatst met een ander persoon, die we vanaf nu de “Ander” zullen noemen. Deze andere persoon is iemand die u niet kent en die u ook niet zal ontmoeten in de toekomst. U en de “Ander” zullen keuzes maken door het omcirkelen van de letter A, B of C. Uw eigen keuzes leveren punten op voor uzelf en de “Ander”. Ditzelfde geldt ook voor de andere persoon en deze persoon zal dus ook punten vergaren voor zichzelf en voor u. Ieder punt heeft waarde: Hoe meer punten u krijgt, hoe beter voor u, en hoe meer punten de “Ander” krijgt, hoe beter voor die persoon.

Hier is een voorbeeld van hoe deze opdracht werkt:

| | A | B | C |
|---|---|---|---|
| U krijgt | 500 | 500 | 550 |
| de “Ander” krijgt | 100 | 500 | 300 |

Volgens dit voorbeeld levert een keuze van A u 500 punten op en de “Ander” 100; als u B kiest krijgt u 500 punten en de “Ander” 500; en als u C kiest krijgt u 550 punten en de “Ander” 300. U ziet dat uw keuze zowel het aantal punten dat u, als de “Ander” krijgt, beïnvloedt.

Het is belangrijk om te onthouden, voordat u keuzes begint te maken, dat er geen slechte of goede antwoorden zijn. Kies de keuze die u, voor wat voor reden dan ook, prefereert. Daarnaast is het belangrijk om te onthouden dat de punten waarde hebben: Hoe meer u er heeft, hoe beter dit is voor u. Dit geldt ook voor de “Ander”: hoe meer punten die persoon krijgt, hoe beter het voor die persoon is.

Omcirkel voor de volgende negen situaties een A, B of C, afhankelijk van het antwoord dat u prefereert.

| 1) | A | B | C |
|---|---|---|---|
| U krijgt | 480 | 540 | 480 |
| de “Ander” krijgt | 80 | 280 | 480 |

*Ga verder met het opdracht op de volgende pagina.*

| 2) | A | B | C |
|---|---|---|---|
| U krijgt | 560 | 500 | 500 |
| de “Ander” krijgt | 300 | 500 | 100 |

| 3) | A | B | C |
|---|---|---|---|
| U krijgt | 520 | 520 | 580 |
| de “Ander” krijgt | 520 | 120 | 320 |

| 4) | A | B | C |
|---|---|---|---|
| U krijgt | 500 | 560 | 490 |
| de “Ander” krijgt | 100 | 300 | 490 |

| 5) | A | B | C |
|---|---|---|---|
| U krijgt | 560 | 500 | 490 |
| de “Ander” krijgt | 300 | 500 | 90 |

| 6) | A | B | C |
|---|---|---|---|
| U krijgt | 500 | 500 | 570 |
| de “Ander” krijgt | 500 | 100 | 300 |

| 7) | A | B | C |
|---|---|---|---|
| U krijgt | 510 | 560 | 510 |
| de “Ander” krijgt | 510 | 300 | 110 |

| 8) | A | B | C |
|---|---|---|---|
| U krijgt | 550 | 500 | 500 |
| de “Ander” krijgt | 300 | 100 | 500 |

| 9) | A | B | C |
|---|---|---|---|
| U krijgt | 480 | 490 | 540 |
| de “Ander” krijgt | 100 | 490 | 300 |