

SITUATIONAL AND PERSONALITY FACTORS IN LEADERSHIP BEHAVIOR

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Samenvatting

De meeste mensen gaan in groepen naar grote evenementen; om dus in het geval van een calamiteit goed te kunnen reageren en communiceren is kennis over deze groepen vereist. Groepen kunnen meerdere soorten leiders hebben, hiervan zijn twee belangrijk een formele of een informele leider. Het werd verwacht dat deze type leider van invloed zou zijn op de afstand tussen de groepsleden en het succes van het leiderschap. Er werden verder een mogelijke mediator, meerdere mogelijke onafhankelijke variabelen, en mogelijke moderatoren onderzocht, namelijk overzicht (als situationele én als trek-variabele), openheid, extraversie, leiderschapskwaliteit, representativiteit van de leider en hechtheid van de groep. Een experiment was uitgevoerd met groepen met formele en informele leiders, waar de participanten twee vragenlijsten in moesten vullen en daartussen twee teambuilding activiteiten en een speurtocht moesten doen. De type leider voorspelde leiderschapssucces en groepshechtheid bleek een mediator te zijn, de overige voorspelde effecten waren niet terug te zien in de data. Het kennen en leuk vinden van anderen, bleek uit de correlaties, speelt een belangrijke rol. Dit effect zou sterker dan in andere onderzoeken geweest kunnen zijn, omdat er maar weinig participanten ($N=55$) waren en veel van de groepjes waren vrienden.

Abstract

On large events, most people come in groups, and for appropriate handling of calamities knowledge of these groups is essential. Groups can have at least two kinds of leaders, formal and informal leaders. The type of leader was expected to have an influence on the interpersonal distance between group members and the success of leadership. Several possible other variables with a possible mediating and moderating role, or independent variables were introduced, namely overview (a state and a trait variable), openness to experience, extroversion, leadership quality, leader prototypicality, and unity of the group. An experiment was conducted with groups with informal and formal leaders, where the participants filled in a pre- and post-questionnaire; in between these measurements, they did two teambuilding activities and a scavenger hunt. Type of leader predicted leadership success and unity appeared as a mediator. The other effects, however, could not be found in this data. The knowledge and liking of others seemed to play an important role. This effect might have been stronger than in other research projects, due to the small number of participants ($N=55$) and the fact that many groups consisted at least partly of friends.

1. Introduction

In case of an emergency, the organizing party of a large event has to find an effective and efficient way to communicate to the crowd of visitors how to properly react. To influence the visitors to behave in a desired way, the organization needs to know about the behavior of crowds. New and more efficient ways of communication could be invented, if the number of people to be informed would decrease. While camera and satellite observations are vulnerable to daylight and clear sight, Wi-Fi-data can be obtained relatively easy and can give valuable information about the positioning and movement of individuals (Gioia, Sermi, Tarchi, & Vespe, 2017). Furthermore, for the effective dealing with unforeseen circumstances, leaders can take an important role in guiding the crowd (Aubé & Shield, 2004). In their study, leaders with knowledge about escape strategies were members of the crowd, and therefore guiding from within (Aubé & Shield, 2004). A crowd consists at least partly of groups of individuals and in most groups, there is one member that has the most influence, a leader. This leader not only influences group decisions, but also generally group behavior (Bass & Bass, 2008).

Leadership has been researched a lot, and not only in recent years. On scopus the oldest articles date back to 1872 and the total number of articles is around 153.000. When searching for 'leadership type', however, there are only 88 results ("Scopus Search," n.d.). In an informal group the leader emerges, which might be an unconscious process to most members (Berg, Houwelingen, Hart, & Ross, 2011, as cited in Jellema, 2016), whereas in a formal group, a leader could be appointed by someone higher up the hierarchy or by a democratic decision.

Previous research shows, that behavioral measures with which a leader could be detected, exist (Reicher, Haslam, & Hopkins, 2005). A difference in status can have an influence on the distance between people (Dean, Willis, & Hewitt, 1975); the leader of a group can be compared to a person of higher status and therefore a difference in distances to a leader as compared to other group members could be expected. In a previous project with a similar design as the current study, it was found that groups with formal leadership walked longer total distances during a scavenger hunt than groups with an informal leader (Jellema, 2016). Yet, there were different results about the distance between leaders and followers. While one study found that a leader kept closer to his or her followers than the followers with each other (Jellema, 2016), another study found the opposite (Kock, 2016). Kock (2016) claims that "in the literature a larger physical distance is often referred to as a negative moderator for leadership results" and that representativeness is a predictor of the distance. A

small distance, she claims, is a sign of connection between the leader and the followers and results in good leadership results (Kock, 2016).

The main goal of this research is to replicate the effect of the type of leader on interpersonal distance, and identify factors that influence this relationship. Since a person's character manifests itself in behavior, it is expected that a leader's distance to members is different than the distance between the other group members. The three character traits examined in this project are the need for overview, openness to experience and extroversion. People show distinct behavior in different situations, therefore situational factors, also called state- factors are taken into account as well. In this case, the actual presence of an overview, leadership quality, leadership prototypicality, cohesion, and interconnectedness are tested.

2. Theoretical background

2.1. Leadership

Leadership can be and often is defined in many ways; the Bass Handbook of Leadership (Bass & Bass, 2008) has a whole chapter dedicated only to the different definitions of leadership. They describe three main approaches to defining leadership: the 'leader centric' approach, which concentrates on the leaders characteristics; leadership as an effect, where the main focus lies on the outcome; and leadership as interaction between the leader and the followers, defining leadership in terms of a process or relationship (Bass & Bass, 2008). In the current research, leadership was examined with a focus on interaction between the leader and the led, with the leader occupying a different role within a group than other members of the group. Leadership was defined as having more influence on a group decision than other members.

Leadership was then divided into two types. As mentioned before, there are formal and informal groups, which consequently have formal and informal leaders. A formal leader is picked by an authority, in this case the researcher, and has more power than other group members, e.g. to make final decisions (Ross, 2014). Although a formal leader has more power, there might be another leader within the group (Johannessen, McArthur, & Jonassen, 2015). This perceived leader is called an informal leader; an informal leader might also emerge in a group that has no leader. Consequently, an informal leader can be part of a formal or informal group. If an informal leader emerges in an informal group, it might be that members of the group are unaware of this process or that the formal leader proves not to be suitable for his or her role. Both kinds of leader influence the behavior of the group more than their followers.

When assessing leaders and leadership, there are three important aspects: leadership success, leadership quality, and leader prototypicality. The success of leadership is often set equivalent to the group outcome. In other words, a leader's success is making the group successful (Reicher et al., 2005). Unlike success, quality of leadership is related to the leader himself and is independent of the skills of the group members. Leadership quality is how well the leader lives up to expectations and how well his or her leadership style is liked (Steffens et al., 2014). Leadership prototypicality, also known as representativeness, refers to the connection between the leader and the rest of the group (Steffens et al., 2014).

2.2. Introduction to situational and personality factors

2.2.1. Overview

In the literature, the term 'overview' is mostly used to describe a text-type instead of a construct and although there are similar constructs, no synonym could be found. It was therefore hard to find research on the topic and the following was deducted from reasoning.

A clear distinction should be made between overview as a state and as a trait. The attempt, or the constant trying to get an overview, is considered a character trait, also called need for overview. It is assumed to be an innate desire, and a distinguishing quality every person owns to a different degree. If a leader has a strong overview trait, he or she might to try harder than another leader to get an (visual) overview and therefore keep a higher interpersonal distance than the followers.

Independently of how hard someone tries, he or she would have situations in which it is achieved to perceive to have an overview and other situation where it is less so. Therefore, the actual 'perceived ownership' of overview is considered a state variable, it can be very different depending on the situation. If someone assumes to have an overview, it might be expected of a leader to keep close to the followers, to be part of the group and know the group. Accordingly, the interpersonal distance would be expected to decrease.

To effectively influence others, someone should be aware of the situation, his or her goal, and characteristics of the person that is to be influenced (Olson, Amlani, Raz, & Rensink, 2015). This could be transferred to leadership, so to be an effective leader, one has to have an overview over the group, the situation, and the task. Overview was defined as being well-aware and understanding of what is happening, knowing what is going to or should happen, and seeing the connections between events and persons, in other words the person is aware of his or her surroundings and understands them.

2.2.2. Group unity

Unity of a group relates to the interconnectedness and the cohesion within the group. Group cohesion is how well a member identifies him- or herself with the group, how strong the association or identification of oneself with the group is (Podsakoff, Niehoff, MacKenzie, & Williams, 1993). Connectedness is how well someone feels integrated into the group and feels like he or she is part of the group (Aron, Aron, & Smollan, 1992). Since cohesion and interconnectedness are so closely related on a construct-level, they are combined to one variable. According to Steffens et al. (2014), a leader has to act as an ‘identity entrepreneur’, meaning that he or she has to create a shared social identity. Hence, a leader can forge social bonds with and between the members and therefore improve group cohesion and interconnectedness (Steffens et al., 2014).

2.2.3. Openness to experience and extroversion

Openness to experience and extroversion are part of the Big Five, which is a widely used model for personality. It states that the human personality consists of five aspects, namely extroversion, agreeableness, conscientiousness, neuroticism, and openness to experience. In this study only openness to experience and extroversion are used, because Sanchez-Cortes, Aran, Mast, and Gatica-Perez (2012) indicated that only those two are related to leadership. An extrovert is talkative, assertive and energetic (John & Srivastava, 1999). Thus, extroversion is related to leadership, since an outgoing person who is likely to talk more is also more likely to talk for the group, express opinions or take the initiative to address the group. A high amount of talking is also related to leadership (Judge, Piccolo, & Kosalka, 2009; Sanchez-Cortes et al., 2012), and therefore an extrovert could be expected to likely emerge as a leader. Furthermore, Judge et al. (2009) concluded from multiple sources that it is the “optimistic views of the future” that lets extroverts emerge as leaders. Openness to experience has to do with “creativity, complexity, and broad interests”(John & Srivastava, 1999). As Judge cited in (Judge et al., 2009), individuals scoring high on openness to experience are able “to challenge conventional wisdom [...] and visualize a compelling future [...]”. Adding to that, openness is also related to intellectual stimulation and inspirational motivation, which are characteristics of a type of leadership.

2.3. Conceptual model

The type of leader in the group and leadership success were determined per group, whereas all other constructs were measured per participant. Leadership quality and prototypicality refer to how the participant experienced the quality and prototypicality of the perceived leader.

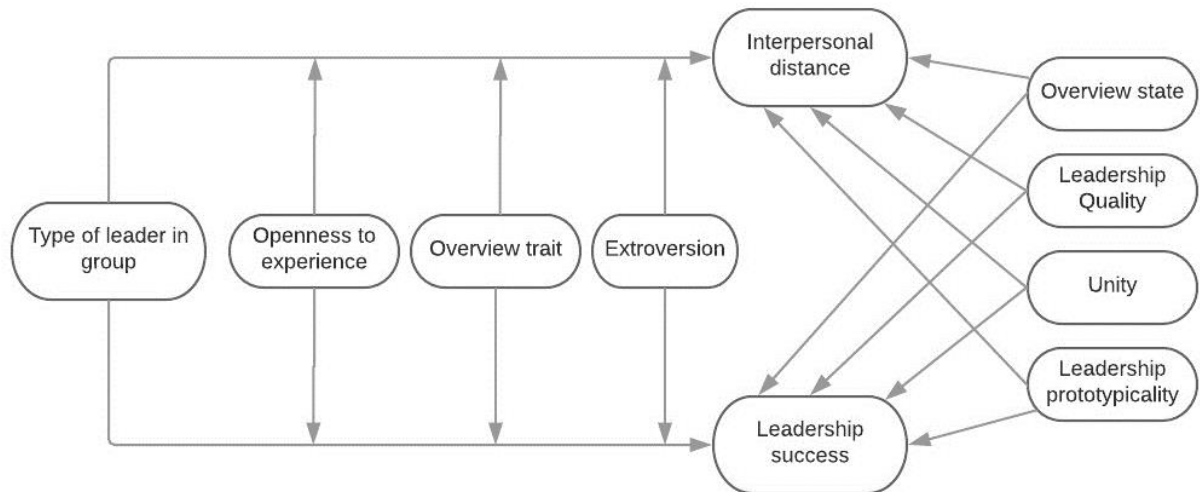


Figure 1 Conceptual model

3. Method

3.1. Design and participants

In this study, a two (leadership: formal vs. informal) factor between-subject design was used. The independent variable is the type of leader (informal vs. formal), hence whether the group had a formal leader or not. The dependent variables were the leader-follower-distance and leadership success. All participants were students of the University of Twente, 43 (78.20%) of which studied Psychology, 4 (7.30%) communication sciences and 8 (14.50%) another study. The time they spent on their study program was measured in months, ranging from 2 to 87 months of studying at the University of Twente with a mean of 9.40 ($S.D.$ = 16.51) months. Study time at other Universities was not included. 45 (81.80%) participants did not live on campus. The age of the participants ranged from 18 to 28 with a mean of 20.46 ($S.D.$ = 2.63); there were 17 (30.90%) male and 38 (69.10%) female students; 39 (70.90%) had a German nationality, 9 (16.40%) a Dutch nationality and 7 (12.70%) had a different nationality. Focus of this study were differences between individuals, not groups.

3.2. Procedure

To find participants, convenience sampling was used; the participating students were either of the social surrounding of the researcher or joining through a participant system, where psychology and communication science students participated in exchange for partial course

credit. The study was advertised with posters in different University buildings, and students were directly asked to participate.

There were 14 groups, ranging from three to six members per group with an average of 4.24 ($S.D.=1.19$). These groups had a total of 55 participants, 27 (49.09%) participants were in the formal leadership type group, and 28 (50.90%) in the informal leadership type group. Groups were numbered and all odd group numbers were assigned to the informal leadership type group and all even group numbers to the formal. In the informal leadership type group, no leader was depicted and therefore a leader had to emerge, whereas in the formal group a leader was chosen. This choice was randomized by picking first the person who chose to sit to the right of the researcher, in the second group two places to the right of the leader and so on.

The researcher introduced herself and told the participants that this study was about group behavior with the focus on objective data, which was measured by GPS-trackers and sociometric badges. Next, the participants were asked to fill in a questionnaire, which can be found in Appendix A. To increase the connection between the participants, they had to do two teambuilding exercises, see Appendix B. The teambuilding activities were completed with the researcher in the room but without interfering; while during the scavenger hunt itself, the group was not accompanied by the researcher, in order to make it feel more natural for the participants and reduce bias.

In the formal group, the information about the team building exercises and the scavenger hunt was given to the leader, while in the informal group the information was placed in the middle of the table to see who took it first. The goal of the scavenger hunt was to find places on the campus of the University of Twente and performing small tasks; to find the places, they got clues in the form of one picture per location (refer to picture). An example for a task would be to take a picture at a certain location with at least one cyclist and one car on it. Each group had 20 minutes time to find as many locations as possible, although some groups came back late or early, the average time was 25.30 minutes ($S.D.= 3.46$). The complete scavenger hunt consisted of fourteen locations, each with a small task (Appendix C). The scavenger hunt was designed to be too difficult to complete within the time to put some pressure on the group to do their best and to have comparable results. Earlier similar studies had problems with ceiling effects, this was avoided by making it more difficult for the groups. Out of fourteen, the mean number of found locations was 2.71 ($S.D.= 1.88$) and tasks completed 2.65 ($S.D.= 1.89$). For both the range was from 0 to 6. After returning to the start location, the group discussed with the researcher the locations and tasks and each was given

another questionnaire for their perception of their leader, group cohesion, interconnectedness and perceived overview over the group. After that the researcher debriefed them about the real goal of the study, namely researching leadership, what the important variables were and answered questions of the participants. The participants signed a debriefing form which can be seen in Appendix C. Students of psychology and communication sciences received credits for their participation, other students were given a cookie or offered some coffee.

3.3. Measurements

A combination of subjective and objective measurements was chosen. The objective data was measured with GPS-trackers and sociometric badges, whereas the subjective data was obtained with two questionnaires, one before and one after the main task. Observations included the type of leader, group size, assigned leader (in the formal leadership type groups only), number of locations found, number of completed tasks, and which member took initiative through taking the assignments (in the informal leadership type groups only) and the pictures during the task. Leadership success was measured by how many locations were found and how many tasks were completed.

How well the participants knew and liked each other was measured on a Likert-scale from 1 to 5, with 5 meaning that they knew each other very well and talked regularly. The leaders of each group were excluded from knowing and liking themselves, the mean of the other group members knowing the leader was 2.68 (*S.D.*=1.71) and for liking the leader it was 3.90 (*S.D.*= 0.84). For knowing and liking of other group members the leaders were not excluded. The members knew each other with a mean of 2.73 (*S.D.*= 1.41) and liked each other with a mean of 3.78 (*S.D.*= 0.95). That the average values for knowing each other are below 3 mean, that most of the participants did not know each other.

3.3.1. Questionnaire

The questionnaire for the premeasure included demographic questions, information about how well they knew and liked the other participants at that time, and measures for openness to experience and extroversion. The post-questionnaire asked the participants to give a ranking of the amount of leadership of each member including themselves, leadership prototypicality and quality of leadership. The previously mentioned measures were used only in the named questionnaire, whereas the need for overview and the actual perceived overview, interconnectedness, and group cohesion were included in both pre- and post-measures.

3.3.1.1. Leadership, leadership prototypicality, and leadership success

Participants were not given a definition of leadership, because they should rely on their feelings to pick someone who acted like a leader. Giving them a definition might have caused them to think in these terms rather than relying on a feeling. While formal leadership was given, perceived leadership was measured through ranking (see questionnaire in Appendix A). The ranking was between all members of the group, hence the member included themselves in the ranking. 15 leadership points were to be split across all group members, with no two having the same number of points. More leadership points meant that this person had a high level of leadership. For the analyses, it was only noted who was picked as a leader and not the number of points, because due to the different group sizes the numbers were not comparable. This was done equally in all groups, to check whether the formal leader was also perceived as a leader during the task.

3.3.1.1.1. Prototypicality of leadership

For the measurement of leadership prototypicality, a subscale of the Identity Leadership Inventory (Steffens et al., 2014) was used. The original subscale for prototypicality consists of four items, one of which was omitted due to a mistake. An example of an item is “This leader is representative of members of the group”. Cronbach’s alpha and Guttman’s Lambda-2 both were 0.86. The items for prototypicality were recoded, so that a higher score means more prototypicality. In this questionnaire, one stood for totally agree and five for totally disagree. After recoding, a mean score was calculated for the analyses. The histogram and the Q-Q-plot of prototypicality looked similar to a normal distribution, and also skewness (0.17, *S.E.* = .32) and kurtosis (-.92, *S.E.* = .06) seemed to indicate a normal distribution. The Shapiro-Wilk-test also indicated a normality ($p=0.05$). Prototypicality can therefore be treated as normally distributed.

3.3.1.1.2. Leadership success and quality of leadership

Leadership success and quality of leadership were measured in different ways. Leadership success was measured by a sum score of the number of locations the group found and the number of successfully completed tasks, divided by the time the used. The time had to be considered, because it had a wide range between 16 and 30 minutes and all groups should be equally judged. The time was taken from the GPS trackers. For those participants who had no working tracker (see GPS for details), the average of the other members was rounded to minutes, calculated and used. This was possible because the group went together and each member was busy for the same amount of time.

Quality of leadership was measured with two items. The first item compared the behavior of the leader with what the participant expects from a leader (The above-mentioned leader behaved a lot like I would expect from a leader.), and the second one compared with how well the participant liked the way of leading used by the leader (I liked the way the above-mentioned leader led the group.). For these two items, there was a Pearson correlation calculated resulting in a $r=.71$. These two items were also recoded, and again, a mean score was calculated for further analyses. Quality of leadership had skewness (-.37, *S.E.*: 0.32) and kurtosis (-.41, *S.E.*: .63) within a normal range, but the Shapiro-Wilk test was significant ($p=.02$), and the histogram and Q-Q-plot did not indicate a normal distribution. Therefore, quality of leadership was not treated as normally distributed.

3.3.1.2. Overview

Both state and trait variables of overview were measured with ten items covering the three aspects of overview; the group, the task and the situation. There was no pre-existing survey available, therefore one was constructed to the needs of this study. An example item for measuring the need for overview (trait) was ‘I try to recognize influences on our group and its behavior.’. These were asked both in the pre- and in the post-test, with the post-test including trying to get an overview throughout the experiment and not only whether or not overview had been established after the experiment. Reliability analyses for the trait overview were calculated for before and during the experiment. Cronbach’s alpha and Guttman’s Lambda-2 for the pre-test were .90, for the post-test they were .80 and .82 respectively. A paired samples t-test was conducted to test for a significant difference between the pre- and the post test, which was not significant ($p=.14$). Therefore, it could be reasonably concluded that need for overview is a trait variable. Another reliability analysis was conducted for all items of the pre- and the post-test together, resulting in a Cronbach’s alpha of .86 and Guttman’s Lambda-2 of .88. For the further analyses, a mean score for the pre- and post-tests was used. The overview trait variable had an insignificant Shapiro-Wilk-test ($p=.37$), and a reasonably normal histogram and Q-Q-plot, and therefore it can safely be assumed to have a normal distribution.

The state variable of perceived overview was measured with almost the same items, only they asked about having an overview, instead of trying to attain one. “I have an overview over the situation.”, would be an example item. Before the experiment it reached a Cronbach’s alpha of .85 and a Guttman’s Lambda-2 of .86, after the experiment the values were respectively .81 and .82. All items together had a Cronbach’s alpha of .83 and Guttman’s Lambda-2 of .85. Based on these high reliability values, a mean score was calculated. The perceived overview variable had an even higher insignificant Shapiro-Wilk-

result ($p=.78$), with a normal enough looking histogram and Q-Q-plot. Therefore, perceived overview, too, was considered normally distributed.

3.3.1.3. Extroversion and openness to experience

Extroversion and openness to experience were measured by using the corresponding items from the Big Five Inventory (John & Srivastava, 1999). There were eight items for extroversion and ten items for openness to experience, examples for items of this scale are “I see myself as someone who is talkative” (extroversion) or “I see myself as someone who is curious about many different things” (openness to experience). The items were used in the same order as they appeared in the BFI, but the Likert-scale was reversed compared to the manual. Therefore, all items were recoded as to have a higher score meaning more extroversion or openness. Since most of the items of extroversion and openness are recoded, only those who were not recoded are mentioned here. Those items treated the topic of being reserved, tending to be quiet, being sometimes shy and inhibited, preferring work that is routine, and having few artistic interests. All items were measured on a 5-point Likert-scale from 1 (agree strongly) to 5 (disagree strongly). Extroversion scored a Cronbach’s alpha of .87 and Guttman’s Lambda-2 of .88, while openness to experience had a Cronbach’s alpha of .82 and a Guttman’s Lambda-2 of .84. With these good reliability values in mind, mean-scores were calculated with regards to both extroversion and openness to experience for further analyses. For extroversion and openness to experience, the Shapiro-Wilk test of normality was significant ($p=.03$ each), but their histograms and Q-Q-plots looking fairly normal distributed. Skewness and kurtosis for extroversion were $-.42$ ($S.E.:.32$) and -0.77 ($S.E.:.63$) respectively. In line with this and an insignificant Kolmogorov-Smirnov-test ($p=0.2$), extroversion could be treated as normal. Openness to experience had higher skewness ($-.90$, $S.E.:.32$) and kurtosis (1.47 , $S.E.:.64$), but also a significant result on the Kolmogorov-Smirnov test. It was therefore also accepted as normally distributed.

3.3.1.4. Unity

Although cohesion and interconnectedness were supposed to measure the same construct, unity, they were measured in different ways. Cohesion was measured with a subscale of the Revised Substitute for Leadership Scale (Podsakoff et al., 1993). The six items were measured on a 5-point Likert-scale; an example of which is “There is a great deal of trust among members of my group.”. Interconnectedness was measured by asking the participants which one out of seven visual representations best depicted how well connected they felt with the group. These visualizations were taken from the Inclusion of Other in the Self Scale (Aron

et al., 1992). It is only one item, but due to its seven possible answers it is not readily compatible with the cohesion scale. To make it compatible, it was rescaled to a five-point scale with the formula shown below. In this formula, Y represents the rescaled value, x the old value, a the old minimum, A the new minimum, b the old maximum, and B the new maximum.

$$Y = \frac{(B-A) \times (x-a)}{(b-a)} + A \quad (1)$$

The rescaling was done before the reliability analysis and the composing of a combined mean score with cohesion. Reliability analyses were conducted for all items of the cohesion scale and the interconnectedness, one for the pre- and one for the post-measurement. For the pre-measure Cronbach's alpha and Guttman's Lambda-2 were .93, for the post-measure they scored .88 and .91 respectively. Therefore, mean scores of cohesion and interconnectedness were calculated for before and after the experiment to be used in further analyses. The Shapiro-Wilk-test and the Kolmogorov-Smirnov-test for unity were significant ($p < .01$ for both), and also the histograms and Q-Q-plots did not reasonably indicate a normal distribution. Unity was therefore regarded as not normally distributed.

3.3.2. GPS

To measure interpersonal distance, the iGotU GT-600 GPS-trackers were used. This is a small device that participants wore around their neck. It measures the position of the participant once every second with an accuracy of up to five meters, being lower near buildings or large trees. Positional data is stored as one degree of longitude and one of latitude linked to a time stamp. Consequently, there should be one location per second per participant, with which different variables can be calculated. These positions can be plotted and



Figure 2. Example GPS-plot

projected on a map, an example can be seen in Figure 2. To improve accuracy, every participant was given two trackers during the scavenger hunt. As it turned out, many trackers did not work, therefore no GPS-data could be measured for 13 (23.64%) of the participants, while for the other 43 (76.36%) participants only one tracker was functional. For this study, the average leader-follower-distance for the formal and the informal leader, the average distance between group members, the duration, the speed, and the total distance per participant were calculated. These calculations were done using the program Psysphere

(Ziepert, n.d.), which is a package to be used in the statistical program R. Total distances or distances between persons could be calculated by adding up the distances between each position. As dependent variable for the analyses, a mean score for the interpersonal distance was calculated by averaging the scores of the distance to the informal leader, formal leader and the other followers.

3.3.3. Sociometric badges

The participants were also given sociometric badges during the experiment, which measure the number of face-to-face interactions by infrared detectors, the proximity between participants wearing a badge with Bluetooth, physical activity like posture and energy, and speech features like number of interruptions or how often someone took a turn speaking. Due to technical issues, however, there were only three badges available for the groups of up to six persons, subsequently it was decided to not use this data.

4. Results

To check whether the manipulation worked, the leadership ranking was compared to the formal leaders. 5 (71.43%) of the 7 formal leaders were also perceived as the leader by the group.

4.1. Correlations

To get a first impression of the data, a correlation table including all (non-categorical) constructs for the model, and acquaintances, liking of others, study time, age, and residence on campus was composed (see Table 1). Due to the fact that some variables were not normally distributed, both the Pearson and the Spearman correlations were calculated, and bootstrapping was used.

The dependent variables show very different patterns in their correlations. Surprisingly, interpersonal distance did not correlate significantly with any of the proposed mediators or moderators. It did, however, correlate negative with residence on campus and the liking of other members of the group. It seems logical, that people who like each other stay closer together. Leadership success did correlate significantly with openness to experience, leadership quality, unity, and the average liking of other group members.

As expected, the overview trait and state had a correlation in the lower significant area ($.45 > p > .39$). Perceived overview correlated further significantly with knowing and liking of other group members, study time, and leadership prototypicality. The former two are suggesting that it is easier to have an overview, if the surroundings, i.e. other members of the

group and campus, are familiar. There were also small (insignificant) correlations between perceived overview and the two dependent variables, namely interpersonal distance and leadership success.

Table 1. Correlations, means, and standard deviations of dependent variables, possible moderators and mediators, and demographic variables. For each correlation, first the Pearson correlation and then the Spearman correlation is shown. Both were calculated with bootstrapping of 1000 samples. * indicates significance at the .05 level, ** indicates significance at the .01 level

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Interpersonal distance														
2. Leadership success	.14													
3. Perceived overview	-.15	-.14												
4. Overview trait	.04	.03	.39*											
5. Openness to experience	.01	-.37*	.10	.05										
6. Extroversion	-.08	.10	.06	.09	.01									
7. Leadership quality	-.18	.27	.21	-.08	-.19	.18								
8. Unity	-.03	.47**	-.03	-.12	-.04	.04	.46**							
9. Leadership prototypicality	-.12	.36*	.03	-.01	.03	.09	.46**	.51**	.50**					
10. Age	-.09	.15	-.27	-.33*	.12	-.07	.06	.24	-.11					
11. Study time	-.13	.27	-.23	-.23	.13	-.12	.08	.26	-.13					
12. Residence on campus	.14	-.09	-.32*	-.43**	.18	-.25	-.18	-.02	-.22	.60**				
13. Average acquaintances	.21	-.03	-.41**	-.36*	.21	-.07	-.14	-.07	-.23	.54**				
14. Average liking of others	-.16	-.01	-.28	-.38*	.05	-.07	-.21	-.09	-.26	.61**	.81**			
	-.39*	.15	-.20	-.42**	-.02	-.01	-.09	-.07	-.24	.47**	.45**			
	-.05	-.18	.55**	.21	-.19	.19	.15	-.37*	.20	-.47**	-.44**	-.31*		
	-.03	-.13	.55**	.27	-.18	.19	.10	-.31*	.19	-.49**	-.47**	-.24		
	-.33*	-.41**	.51**	.04	-.09	-.02	.07	-.40**	.11	-.36*	-.22	-.11	.70**	
	-.27	-.35*	.55**	.13	-.06	-.01	.12	-.30	.12	-.48**	-.45**	-.10	.78**	
Mean	11.68	.21	3.64	3.75	3.53	3.36	3.23	.10	3.11	20.46	9.40	4.62	2.70	3.80
SD	13.45	.15	.48	.48	.65	.78	.91	1.49	.86	2.63	16.51	14.88	.87	.87

4.2. Model testing

4.2.1. ANOVA's

First it was tested whether the means of the dependent variables differed between the groups with different type of leadership. The means can be seen in Table 2. The Levene's test for homogeneity of variances was conducted with interpersonal distance for the two leader types. The result was non-significant ($df=40$, $p=.15$), indicating that the variances are comparable and an analysis of variance (ANOVA) can be conducted. A one-way ANOVA was conducted for interpersonal distance grouped by type of leadership in the group, which was not significant ($F=.63$, $df=41$, $p=.43$). This means that there is no statistical significant difference of interpersonal distance between the type of leadership groups.

For leadership success as dependent variable grouped by type of leadership, the Levene's test for homogeneity of variances was significant ($df=53$, $p<.01$), meaning that an ANOVA could not be conducted. Instead, the Brown-Forsythe and the Welch-test were being conducted, both significant with a $p<.01$ ($df=38.97$). Therefore, the average leadership success was significantly different in both leadership groups.

Table 2. Means of dependent variables grouped by type of leadership

Dependent variable	Type of leadership	Mean	S.D.
Interpersonal distance	Formal	13.50	16.40
	Informal	10.17	10.58
Leadership success	Formal	.13	.08
	Informal	.30	.15

4.2.2. Regression

According to the conceptual model, a regression analysis of all possible moderators and independent variables (interpersonal distance and leadership success) were to be conducted and followed by and moderator- analyses. One of the assumptions for multiple regression is, that the predicting variables should correlate with the outcome variable; as could be seen, there were only insignificant correlations with interpersonal distance, therefore no regression could be conducted. Leadership success correlated significantly with leadership quality, unity, and openness to experience, therefore a regression could be conducted. A stepwise multiple linear regression cannot be conducted with bootstrapping, therefore the not normally distributed variables, leadership quality and unity, had to be excluded from a multiple regression analysis. An appropriate non-parametric analysis was beyond the scope of this

project, therefore independent regression analyses were conducted with bootstrapping for openness to experience, leadership quality and unity.

A simple linear regression analysis was conducted with openness as predictor variable and leadership success as outcome variable. This test was marginally significant ($\beta=-.25$, $t=-1.86$, $df=54$, $p=.07$), with a $R^2=0.06$, meaning that openness to experience can explain 6,10% of the variance in leadership success. Another linear regression analysis was conducted with leadership quality as independent variable and leadership success as dependent variable, this time bootstrapping was used, because of the non-normal distribution of the leadership quality. Even though $R^2=.14$ is low, this regression has a significant result with $p=.01$ ($\beta=.37$, $t=2.89$, $df=54$), i.e. it can safely be assumed that leadership quality explains 13.60% of the variance in leadership success. A third linear regression analysis was conducted, also with bootstrapping, with unity as predictor and leadership success as outcome variable. It has an $R^2=.16$, which is similar to the outcome of leadership quality, it is however more significant with a significance level of $p<.01$ ($\beta=.40$, $t=3.20$, $df=54$).

A moderation analysis with bootstrapping was conducted with leadership type as independent variable, leadership success as dependent variable, and openness to experience as moderating variable. This was done with Andrew Hayes PROCESS module for SPSS (Hayes, 2013). The moderating effect of openness on the relationship from leadership type to leadership success was significant ($R^2=.42$, $F=12.51$, $df=51$, $p<0.01$). The interaction between leadership type and openness was marginally significant ($\Delta R^2=.42$, $F=3.27$, $df=51$, $p<0.08$).

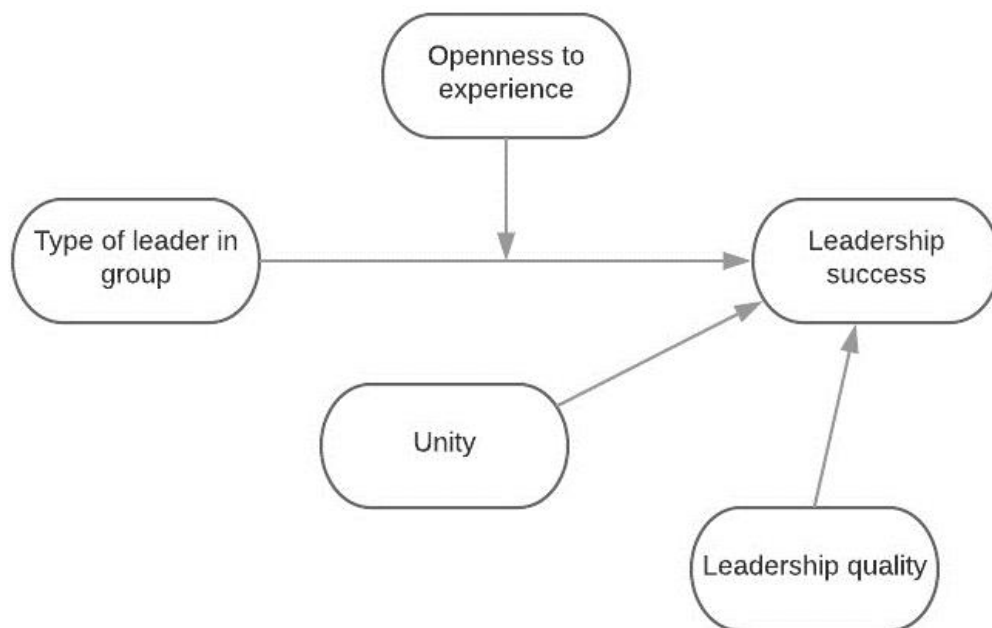


Figure 3 Conceptual model with only those effects that proved significant

5. Discussion

5.1. Interpretations

According to the analysis leadership can be predicted with unity, leadership quality, and leadership type, the latter moderated by openness to experience. Most expected relationships between variables could not be detected, however, this might have been possible with more participants or the Generalized Additive Modelling (GAM). The GAM is a non-parametric alternative for multiple linear regression and could have been used to test the conceptual model. Yet, this method is fairly difficult to use and is impossible with the statistical program used in this study (IBM SPSS). Hence, it was beyond the scope of this project.

It was expected that overview would have an influence on the relationship between the leadership type and interpersonal distance and accordingly leadership success. The relationship with interpersonal distance found in earlier research could not be replicated. Due to this fact, half of the conceptual model rejected. All correlations between interpersonal distance were non-significant, ergo there is little indication for most correlations. Rödder (2017), who conducted a similar study, also could not find a significant difference between her leadership types, which were comparable to those used in this study. This was blamed on the missing teambuilding activities, which were present in the current study.

The overview trait and state variable correlated mostly with demographic data. The fact, that overview trait correlates mainly negative with age-related demographic variables (age, study time, residence on campus), could indicate that this trait shrinks with the maturity of a person. Some of the highest correlations ($r > .50$) were found between perceived overview and the average liking and knowing of other group members, and leadership prototypicality. This indicates a relation to the group composition. If this was the case, however, a correlation with unity would also be expected, which was not the case. Kock (2016) also mentioned that there were different findings in the literature about interpersonal distance. It could be assumed that different results are due to group composition.

5.2. Research design

Due to the small scope of this project, convenience sampling was used and all the participants were students from the same higher education institution. This is not representative of the whole Dutch population, e.g. in terms of age or educational level. Since this is an explorative research, however, it is good to have a homogeneous sample, because there are less variables that might have a distortive influence on the effects. This is especially true for small samples, where individual difference can have a large impact. Furthermore, this research is not

interested in absolute values, but in differences. Absolute values might differ for various groups of the population, whereas there is no reason to believe that this is also the case for differences between people.

Also sample size could have been a problem. The fact that no significant correlation with interpersonal distance could be found might be due to the small sample size of 42 participants who had data for this variable. The same might be true for other variables. Due to the low responsivity, the original data collection period of two weeks had been extended to four weeks; however, due to weather circumstances no further groups could be formed. Hence, this was the maximum possible number of participants within the given timeframe of the research.

Another issue might be that the scavenger hunt was too hard. There were fourteen stations mentioned in the instruction, however, the best score was only six found stations, also one group did not find a single station and three other groups could only find one. This might be due to the fact that there were too many stations, and it cost too much time to find the stations with such detailed pictures and complete the tasks. This might have decreased the participants motivation, because they did not see a possibility to finish it all.

5.3. Implications of research findings

The results from this research cannot readily be generalized. Especially overview has to be researched further, see suggestions for further research. As for the different findings for the relationship between leadership type and interpersonal distance, research on possible interfering variables should take place, one possible variable could be group composition.

5.4. Suggestions for further research

In future research, it could be interesting to look further into the relationship between formal and informal leadership, and interpersonal distance. As earlier mentioned, there might be some unknown variable that influences this relationship and caused differing results in existing research. Since the number of acquaintances and the liking of other members correlated with most of the other variables, an emphasis could be put on forming groups with participants that do not know each other, or groups that know each other to a similar degree. An example of this could be project groups of first year students of the first project.

Overview is a newly introduced concept and could be further explored with qualitative research to identify its aspects and to what other constructs it relates to. With the qualitative information, a set of items to test overview could be created and validated. This could be done for both the trait and the state variable and needs not necessarily relate to leadership.

6. Acknowledgements

Writing this thesis, I learned a lot about myself, efficiency, productivity, writing (especially the process of writing), and of course research. Peter de Vries gave me lots of advice and (to me) surprising new insights into research, without steering too much. He allowed me to be very independent in choosing my own topics and priorities, which made me enjoy every bit of work. Molly Waite made me discover that writing is so much more than a first draft and how I could really work with my writings, her advices will guide many more of my writings. I am also glad for my sister and the many friends and acquaintances who listened to me, gave me feedback in critical discussions and encouraged me. Finally, the BMSlab, Stijn de Laat and Benjamin Ziepert helped me with all the technical issues I ran into, for which I am grateful.

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Appendix A – Questionnaire for pre- and post-measurement

Pre-measures

The questions you will fill in now are a pre-measure before the actual experiment begins. Afterwards there will be a couple more questions about how the experiment went. Please read the instructions carefully and **fill in the complete questionnaire now. You will later get another one for the post-measure.**

1. Your initials (to identify you, but keep you anonymous): _____
2. What are your tracker numbers? _____ and _____. Your badge number is _____
3. How old are you? _____ years
4. What is your gender?
 - ☐ Male
 - ☐ Female
 - ☐ Other
5. Where are you from?
 - ☐ Netherlands
 - ☐ Germany
 - ☐ Other: _____
6. How long have you been studying at the University of Twente? _____ years _____ months
7. What are you studying? _____
8. Do you live on campus?
 - ☐ Yes
 - ☐ No
 - ☐ I have been living on campus for _____ months, but do not live there anymore
9. About your group mates

First, fill in the initials and tracker numbers of the other group members and then indicate how well you know them and how much you like them. Do this for every group member, one after the other. There might be more space than you have group members, you can leave the rest blank. There is *one table per participant!*

		1	2	3	4	5	
Initials and tracker numbers:							
I know him/her	Not at all, I have never seen this face before						Very well, we talk regularly
I like him/her	Not at all, I hate him/her						A lot, we are/could be friends
		1	2	3	4	5	
Initials and tracker numbers:							
I know him/her	Not at all, I have never seen						Very well, we talk regularly

	this face before						
I like him/her	Not at all, I hate him/her						A lot, we are/could be friends

		1	2	3	4	5	
Initials and tracker numbers:							
I know him/her	Not at all, I have never seen this face before						Very well, we talk regularly
I like him/her	Not at all, I hate him/her						A lot, we are/could be friends

		1	2	3	4	5	
Initials and tracker numbers:							
I know him/her	Not at all, I have never seen this face before						Very well, we talk regularly
I like him/her	Not at all, I hate him/her						A lot, we are/could be friends

		1	2	3	4	5	
Initials and tracker numbers:							
I know him/her	Not at all, I have never seen this face before						Very well, we talk regularly
I like him/her	Not at all, I hate him/her						A lot, we are/could be friends

10. Openness to experience and extrovertness

Please indicate on a scale from **1 to 5** how much you agree with the statements below. Write in the left column your score for how much you agree with the statement in the left column. Below is a small table on what the scores mean.

Agree strongly Agree a little Neither agree not disagree Disagree a little Disagree strongly

1	2	3	4	5
---	---	---	---	---

I see myself as someone who ...

Score (1-5)	Statement
	... is talkative.
	... is original, comes up with new ideas.
	... is reserved.
	... is curious about many different things.
	... is full of energy.
	... is ingenious, a deep thinker.
	... generates a lot of enthusiasm.
	... has an active imagination.
	... tends to be quiet.
	... is inventive.

	... has an assertive personality.
	... values artistic, aesthetic experiences.
	... is sometimes shy, inhibited.
	... prefers work that is routine.
	... is outgoing sociable.
	... likes to reflect, play with ideas.
	... has few artistic interests.
	... is sophisticated in arts, music or literature.

11. Overview

Having an overview means that you are well-aware and understand what happens, and what is going to/should happen. You see the connection between things and persons. Please indicate on a scale from 1 to 5 how much overview you have right now.

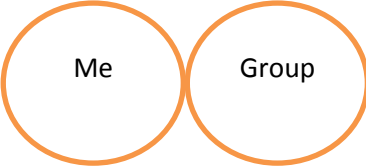
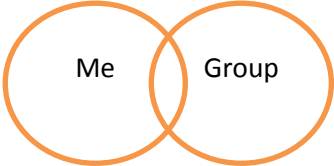
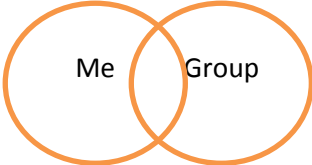
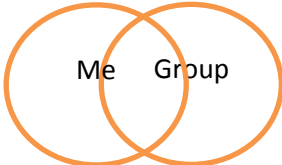
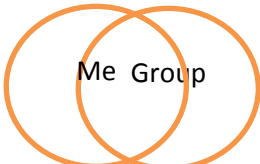
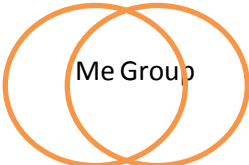

	Not at all				Completely
	1	2	3	4	5
I have an overview over the group.					
I have an overview over the task at hand.					
I have an overview over the situation.					
I am well aware of where the other group members are.					
I am well aware of what the other group members are doing.					
It is clear to me what is expected of the group.					
It is clear to me what has to be done next.					
I have a good view on what is going on within the group.					
I have a good view on what influences the group and its behavior.					
I know how circumstances influence the group					

In the following table, the statements are about how much you try to get an overview and NOT about whether or not you actually have it. Please indicate on a 1 to 5 scale how hard you are trying.

	Not at all				Really hard
	1	2	3	4	5
I try to get an overview over the group.					
I try to get an overview over the task at hand.					
I try to get an overview over the situation.					
I try to know where group members are at all times.					
I try to know what the other group members are doing at all times.					
I try to find out what is expected of the group.					
I try to find out what to do next at all times.					
I try to see what is going on within the group.					
I try to recognize influences on our group and its behavior.					
I try to find out in what way circumstances have an influence on the group.					

12. Connection with group

For this question, please indicate how connected you felt with the group. Indicate which of the following sketches represents your relation with the group best.

- ☐ 
- ☐ 
- ☐ 
- ☐ 
- ☐ 
- ☐ 
- ☐ 

13. Cohesion

Indicate on a scale from 1 to 5 how much these sentences apply to your group.

	Totally disagree				Totally agree
	1	2	3	4	5
There is a great deal of trust among members of my group.					
Members of my group work together as a team.					
The members of my work group are cooperative with each other.					
My work group members know that they can depend on each other.					
The members of my work group stand for each other.					
The members of my work group regard each other as friends.					

Post-measures

1. Group number:
2. Your initials (to identify you anonymously):
3. Your tracker numbers: ___ and ___. Your badge number: ___
4. Leadership ranking

Fill in the initials of all members of the group, including yourself. Now think about who has taken the role of a leader during the scavenger hunt. According to your impression you can split **15 points** between all of you. Do NOT assign the same amount of points to more than 1 member. More points stand for someone with high leadership and less points stand for less leadership. It is possible to fill in 0 if someone did not show any signs of leadership at all, but **there has to be a clear leader (someone with more points than any of the others)**.

Initials + tracker numbers	Leadership points

5. Overview

Having an overview means that you are well-informed and understand what happens, and what is going to/should happen. You see the connection between things.

Again, there is one table for how much you actually had an overview and one for how much you wanted to get an overview. Please fill in, how much you agree with each statement.

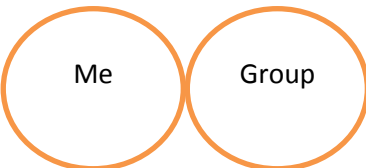
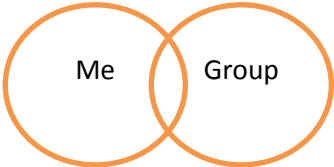
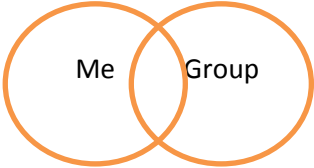
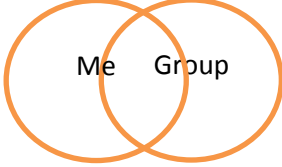
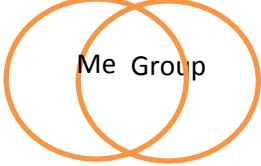
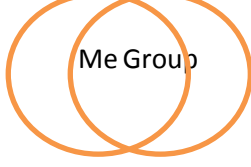
	Not at all				Completely
	1	2	3	4	5
I had an overview over the group.					
I had an overview over the task at hand.					
I had an overview over the situation.					
I was well aware of where the other group members were located.					
I was well aware of what the other group members were doing at all times.					
It was clear to me what was expected of the group at all times.					
It was clear to me what had to be done next at all times.					
I had a good view on what was going on within the group.					
I had a good view on what influenced the group and its behavior.					
I knew in what way the circumstances influenced the group.					

Now indicate, how hard you tried to get an overview.

	Not at all				Really hard
	1	2	3	4	5
I tried to get an overview over the group.					
I tried to get an overview over the task at hand.					
I tried to get an overview over the situation.					
I tried to know where group members were located at all times.					
I tried to know what the other group members were doing at all times.					
I tried to find out what was expected of the group.					
I tried to find out what to do next at all times.					
I tried to see what was going on within the group.					
I tried to recognize influences on our group and its behavior.					
I tried to know in what way the circumstances influenced the group.					

6. Connection with group

Please again fill in your relation with the group. Which of the following represents the situation best?

- ☐ 
- ☐ 
- ☐ 
- ☐ 
- ☐ 
- ☐ 



7. Cohesion and prototypicality

'Leader' refers to whom you gave the most points in section 4.

	Totally agree				Totally disagree
	1	2	3	4	5
There is a great deal of trust among members of my group					
Members of my group work together as a team					
The members of my work group are cooperative with each other					
My work group members know that they can depend on each other					
The members of my work group stand for each other					
The members of my work group regard each other as friends					
This leader embodies what the group stands for					
This leader is representative of members of the group					
This leader exemplifies what it means to be a member of the group					

8. Quality of leadership

	Totally agree				Totally disagree
	1	2	3	4	5
The above-mentioned leader behaved a lot like I would expect from a leader.					
I liked the way the above-mentioned leader led the group.					

Thank you very much for participating in my experiment.



Appendix B – Teambuilding



- Introducing:
Introduce yourself by saying your name and one or two sentences about yourself.
- Turning carpets:
Stand on the carpets and turn it over, so both carpets will lie upside down but do this without having one person touch the floor.

Appendix C – Debriefing form

Debriefing

Titel project: Moving groups – another scavenger hunt

Responsible researcher: Steffi Olbrich s1572288

Period of data collection: 1.11.2017 - 1.12.2017

'I hereby declare that I have been informed in a manner which is clear to me about the actual nature and method of the research as described in the aforementioned information brochure 'Moving groups – another scavenger hunt'. My questions have been answered to my satisfaction. I agreed in my own free will to participate and am aware that I can still ask the researcher to delete my data if I wish to, without any consequences. If I request further information about the research, now or in the future, I may contact Steffi Olbrich (s.l.olbrich@student.utwente.nl; 0633030664).

If you have any complaints about this research, please direct them to the secretary of the Ethics Committee of the Faculty of Behavioural Sciences at the University of Twente, Drs. L. Kamphuis-Blikman P.O. Box 217, 7500 AE Enschede (NL), telephone: +31 (0)53 489 3399; email: l.j.m.blikman@utwente.nl).

Signed in duplicate:

.....

Name participant Signature

I have provided explanatory notes about the research. I declare myself willing to answer to the best of my ability any questions which may still arise about the research.'

.....

Name researcher Signature

Appendix D – Scavenger hunt

You have 20min, be back on time and do not finish all the tasks. Try to finish as many as possible!

Your task as a group is to find the locations of the pictures below and perform a small task at every station. You will not have the time to find all locations, just do as many as possible in the given time (20min). You can choose the order of the locations yourself, but keep in mind that they are presented in a reasonable order. Sometimes it is required to take a picture with group members in it, there is no need to show your face if you do not want to. If you cannot recognize the picture, it might help to look at the next, because they are forming a route, which you have to follow and it might be on the way to the next. If you really do not know how to continue, you can call me (0633030664). You also may look for help online.

DO NOT: run, split up, go into a building, change order of locations

DO: avoid tall trees and buildings (as far as possible), be careful and follow street rules



1. Station: Find this place and count the bars that are indicated in the picture. Write down the number of bars on a separate piece of paper and continue to station 2.



2. Station: If you have found this station, have a look at the closest University building. How many floors does it have? Write this down on the piece of paper with the solution to the first and continue to station 3.



3. Station: These bars lean to a certain direction. Find the bar that stands the furthest to the south and write down into which direction it leans (north, east, south, or west). Continue to station 4.



4. Station: At the parking lot in the background, there is a charging station for electrical cars. Take a picture of at least two of you with the charging station. Continue to station 5.



5. Station: I am sure you have seen this before. Now count the number of bars in this thing and take a picture, where there are half as many hands on the ground as bars in the thing. If it is raining, put your hands on a bar instead of the ground. At least one bar should partly be visible in the picture. Continue to station 6.



6. Station: Count the steps all the way to the top. Write the number down and continue to the next station.



7. Station: Take a picture in front of this building, where one of the group does not touch the ground. It is up to you how you do it. Continue to station 8.



8. Station: Write down the names or make a screenshot of all wifi networks you can receive when you are sitting here. But do not take a break, it is time to go to station 9.



9. Station: Stand where this picture is taken and go a few steps to the left. Which organization is located behind the window? Write it down and go to station 10.



10. Station: Stand on the other side of this sign and take a picture with both a car and a cyclist on it. You might also take the picture on your way to station 11.



11. Station: Retake this picture with one member of your group being in the picture and go on to station 12.



12. Station: Count and write down the number of parking spots, excluding the street leading to it and bicycle spots, but including motorcycle spots. Go to station 13 now.



13. Station: Write down how late it is on the clock in the picture when you are there and the calculate the time it takes until it will show the same time as in the picture (round to 15 min). Go to station 14.



14. Station: Congratulations, you made it. Now look for the researcher, she is hanging around here somewhere.