Informal (small) groups and nonverbal behavioural analysis for emergence leadership characteristics

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Abstract

An increasing number of incidents during crowded events over the last 30 years made people more aware of public safety. Visitors of events tend to come in groups of minimally 2 persons and interact with each other. CCTV systems are used to monitor crowds and could be an adequate tool for safety officers to manage public safety. For an more effective intervention, it is valuable to know beforehand who the leader of a group is. In an observational setting, 32 groups with 4 people each were created. First a series of team building games were used to create the group feeling. Second a task that required interaction with each other. These sessions were used to find leadership within the group. All activity is recorded on video. A combination of introspective dominance scales, dominance & leadership rankings and observed behaviour are used in the analysis. The expected results show that initiative taking is a predictor for emerging leadership. The observed team member dominance is significantly correlated with initiative taking walking action. Initiative taking showed no correlations with the introspective dominance questionnaires. In order to predict leadership, introspective dominance scales, from well tested measures are not sufficient. The Team Member Dominance Scale gives an indication for leadership as a measure.

Keywords: Dominance, Leadership, Small Group, Informal Group, Initiative Taking

In general, events such as concerts and public celebrations elapse quietly and easily, without problems. At the occurrence of an incident, the consequences are terrible (Hijum, 2011). Numerous examples from the last 30 years can be given of asphyxia, crushing and stampeding during events (CNN Sports, 2001; Helbing & Johansson, 2009). The amount of reported incidents increases each decade. This trend is, not entirely remarkable, accompanied by an increased attention for public safety problems (Fan Weicheng, Liu Yi, 2008 (as cited in Wei, Guo, Dong, & Li, 2012)). The report of Hughes states that in the last decades the number of victims of crowd related incidents is approximately 2000 per year (Hughes, 2003; Lee & Hughes, 2006). Most of the incidents occur at sport matches, concerts, festivals and nightclubs (Langston, Masling, & Asmar, 2006).

To tackle these public safety problems it is important to have an insight into crowds. Especially when a large number of people is gathering at a given time at events, for example a rock concert or a sport event (A. Smith et al., 2009). Crowds are generally constituted of small groups (Cartwright & Zander, 1968; Ge, Collins, & Ruback, 2009; N. R. Johnson, 1987). The unpublished study of McPhail shows that visitors of an event, in 89% of the cases, come at least with one other person (Ge et al., 2009). So, the crowd at events consists mainly of groups of minimally two persons, who interact with each other. These groups consist mainly of friends or acquaintances who share an interest or like each other. These so-called self-formed groups are not part of any institutional framework and do not have a leader installed by them. This form of leadership is called emerging leadership and this kind of leadership has a larger influence over the group, in comparison with a leader installed by some authority (Sanchez-Cortes, Aran, Mast, & Gatica-Perez, 2010). The strength of a leader is his ability to transform individual action into group action (Hogg et al., 2006). Interventions could be more effective if the leader of the group will be addressed (Haslam, Reicher, & Platow, 2011).

The number of cameras increases quickly in our daily lives, shopping malls, railway stations, concert halls and on the street. In London only are tens of thousands of cameras active in multiple Closed-circuit television (CCTV) systems (Boom, 2010). The main goal of these systems is to detect, prevent and monitor anti-social and obnoxious behaviour. The increased number of cameras does not directly increase the public safety. More installed cameras means more information to observe, and thus a higher workload in observing all cameras. To make CCTV more useful for

public safety is difficult. Despite the fact that cameras provide a wide angle of view and possibilities to focus and zoom, their intelligence and analytical capacities are limited. The functionality that is missing in a CCTV system is an intelligent tool that helps with the processing of data. With the information provided from the tools, you can act right away when arriving at the location (instead of figuring out what the problem is at that moment).

The evolution of technology and the possibility of realtime video processing gives hope and new perspectives, but also leads to more questions. The use of CCTV could be a useful tool in public safety and crowd observation applications. How can this be used to find group leaders, based on visual observable behavior?

In previous research this problem is partly tackled by observing the behaviour of four people (Ashby et al., 2005; Hung & Gatica-Perez, 2010; Sanchez-Cortes et al., 2010). During these studies, groups of four people are placed in a chair around a table and given a special role to carry out. The presented study is comparable to these studies, with the exception that the group is free to walk through the room and there are no predefined roles.

Theoretical framework

People are social by nature (Aristotle, trans. (2000)), live in groups and act in many different kind of groups (Segall, Lonner, & Berry, 1998). A formal definition of a group is given by Sherif:

> "A social unit consisting of a number of individuals interacting with each other with respect to: Common motives and goals; an accepted division of labor, i.e. roles; Established status (social rank, dominance) relationships; Accepted norms and values with reference to matters relevant to the group; Development of accepted sanctions (praise and punishment) if and when norms were respected or violated." (Sherif, Sherif, & Murphy, 1956, p. 144).

Informal groups In general, two main type of groups can be distinguished, formal groups and informal groups. Formal groups can be found in the context of an organisation. The concept of informal groups, is not commonly used within the literature. Instead a set of labels is used interchangeably: local group, local civil society, clique, friendship group, self-formed group and small group (Pekkanen, 2006).

To get a clear view of what is meant by informal groups, and to prevent from definition errors, a definition of this concept will be given. Informal groups can be defined as a small group of people who gather on a regular basis, to reach a goal or do things they like. The members of an informal group are all equal, close with each other, all have direct contact and no formal hierarchy exists (Tonkens, Duyvendak, & Hurenkamp, 2006). Informal groups know some form of task and role division, but this is generally in a spontaneous way, with the absence of a system or formalisation (van den Berg, van Houwelingen, & de Hart, 2011). An example of an informal group is a subsection of a football team, that go for a run on non-training hours. Now, they are not bound to the guidelines and restrictions of the club (Harrington & Fine, 2000). Another example of informal groups are colleagues, whether from the same department or not, that go for a drink or to a concert after office hours. A counter example of an informal group is a family meeting. Here is a clear hierarchy visible, based on age and family role.

When a number of people are together for the first time, they are more like a set of individuals, they have no connection with each other. The classical model of Tuckman describes five stages of group forming (Tuckman, 1965). This linear model is still accurate for the development of small groups (Brosnan & Hickey, 2012). After the 5 stages, when a group is formed, the individual members are not used to each other, there is no team spirit. Although there is no magic key for group forming, increasing the group cohesion might help the process. This can be done by a variety of activities, for example by team building games (Johnson, 2009).

Leadership

Leadership is a social process of influencing others to understand and agree with what needs to be done and how it is done. It is also the process of facilitating individual and collective efforts to accomplish shared objectives (Yukl, 2006, p. 8). Another definition states that leadership is a process whereby an individual influences a group of individuals to achieve a common goal (Northouse, 2009). These two definitions show that *leadership is a process* and happens between the leaders and the followers. Leaders in informal groups are not installed by some kind of authority and thus have to arise from within the group. This process is called emerging leadership (Côté, Lopes, Salovey, & Miners, 2010; Lord, De Vader, & Alliger, 1986; Sanchez-Cortes et al., 2010; Taggar, Hackett, & Saha, 1999). The roles within informal groups

are self-organized and flexible, any member could become a group leader (Côté et al., 2010). Emerging leadership roles come into in existence via an internal autonomy or an internal egalitarian way (van den Berg et al., 2011). Leadership in informal groups is thus context dependent (Vroom & Jago, 2007). The leader has an *influence over the other group members*. The impact of leadership is stronger in informal groups than in formal groups with an assigned leader (Sanchez-Cortes et al., 2010). One of the purposes of a group is to *achieve a goal* or to satisfy their needs. The leader is steering towards that goal with the intention to succeed (Côté et al., 2010; Haslam et al., 2011).

Leadership and dominance

Dominance refers to the social control over the situation through influence over others (Dovidio & Ellyson, 1982). The personality trait dominance refers to the tendency to behave in assertive, forceful, and self-assured ways (Anderson & Kilduff, 2009; Buss & Craik, 1980; Wiggins, 1979). It seems self-explanatory how this can be linked to leadership. High score in the dominance trait means more assertiveness and motivation to lead, which implies taking control. Previous research shows that taking over by force is not enough, the social competence is an important aspect as well (Anderson & Kilduff, 2009; Van Vugt, 2006).

This theoretical observation is validated by experiments. Based on the scores on the social dominance scale, people with high scores on this scale are more likely to be selected as a leader than low scorers (Kalma, Visser, & Peeters, 1993). A high correlation is found between leadership and sociable dominance, in the context of a winter survival game (Sanchez-Cortes et al., 2010).

Observable leadership behaviour

From social psychology it is known that dominant people move more and talk more than non dominant people (Mullen, Salas, & Driskell, 1989; Sorrentino & Boutillier, 1975; Van Vugt, 2006). It is also shown that dominant people give more input during a discussion (Bass, 1954). Dominant people are visually more active (Aran & Gatica-Perez, 2010; Hall, Coats, & LeBeau, 2005) and people that make a lot of movements are also more dominant than people that move just a little (Hung et al., 2007). These and other examples are explained in depth.

Within a group debate, the members all contribute differently to the conversation. This is clearly visible in an assignment, where the group had to solve a problem by discussion (Bales, 1953; Bass, 1954). An asymmetric distribution in quantity of the contribution became visible for the group members. Some members contributed a lot, other members contributed less. The differences that became visible within the first discussion, stayed stable over multiple discussions within a session. In groups with three, five or seven members, the member with the most input, contributes between 40 and 50% of all contributions. In larger groups (five or more), two or three people contribute more than 60% of the total input (Bales, 1953).

Group members who contribute a lot, generally share information, thoughts and opinions. On the other hand, group members who contribute little ask for information. Members who contribute a lot have an influence on the content, direction and outcome of a discussion. These members determine the direction of the group, while low input members tend to listen and follow the lead of the high input members. Due to this behaviour, the high input members become more dominant over the low input members within the group (Bales, 1953; Bass, 1954).

As shown above, dominant people contribute more to a discussion and thus dominance is an important trait for emerging leadership. How can this information formation about dominance benefit in a CCTV context? Dominance refers to the social control over the situation by forcing influence over the others. The dominator tries to gain attention and interrupt input of others, for example by interruption of the speaker (Dovidio & Ellyson, 1982).

Considering that one of the characteristics of dominance is the interruption of speech, audio signals can be used as one of the indicators for dominance. Multiple facets of audio signals can be analyzed: the total speaking length of a person, the number of speaking turns with and without short utterances, the speaker turn duration, the number of successful interruptions and the speaker energy (volume of speech) (Aran & Gatica-Perez, 2010; Hung et al., 2007; Hung, Jayagopi, Ba, Odobez, & Gatica-Perez, 2008; Mast, 2002; Jayagopi, Hung, Yeo, & Gatica-Perez, 2009). Speaker energy is a construct that performs well, in 82.4% of the cases, indicating the most dominant person in a group. This means that the person who speaks the most within a group, has a chance of 82.4% to be the leader. Speaking length performs even better, with a 85.3% chance to become group leader (Jayagopi et al., 2009). The results of the study of Mast, a meta analysis, are in line with the findings of Jayagopi

et al., where a strong correlation is found between speaking time and dominance (Mast, 2002).

Besides speech, the characteristics of visual movement can be used to predict dominance. Examples of measurements are; the total movement length, the number of changing directions and the number of short movements (Aran & Gatica-Perez, 2010). It is shown that the total visual length in 76.5% predicts the most dominant person (Jayagopi et al., 2009).

It is also possible to combine the auditive and visual information. Combined input can lead to more precise measures, or to new measures. Such a method is the Visual Dominance Ratio (VDR). This classical measure of dominance is applied to dyads (Hung et al., 2008). The VDR is applied to dyads and based on two measures: the time someone spends looking at the other while speaking and the time someone spends looking at the other while listening. The VDR is defined as the ratio of these two and found to be a reliable indicator for dominant behaviour (Dovidio & Ellyson, 1982; Hung et al., 2008). In a later initiative, this classical measure for dyads is transformed and now also applicable to groups (Hung et al., 2008).

Initiative taking is an important aspect in the search for leadership. This is adopted from the Evolutionary Game Theory, which is a tool for studying social interactions and processes (Smith & Price, 1973). This theory states that within a group, the person who takes initiative is more likely to become the leader (Van Vugt, 2006). The people who recognizes situations that require management and co-ordination and react to this are more likely to become leaders, than people who do not (Haslam et al., 2011). The conclusions of Van Vugt, Hogan, and Kaiser are in line with this theory and show that initiative taking is positively correlated with leadership. A different research shows that self-esteem is positively correlated to leadership (Andrews, 1984). Shyness has been associated with low self esteem and shows a negative correlation with leadership (Fordham & Stevenson-Hinde, 1999; Miller, 2003; Judge, Bono, Ilies, & Gerhardt, 2002).

The aim of this study is to find indicators of leadership. Three methods are used to find this: Introspective measures of dominance, Internal rankings from group members and external observations. Do the introspective measures predict the rankings of the group, or do external observations give better predictions?

Method

Participants

A total of 124 participants, divided over 32 groups, participated in this research. The age of the participants differed between the 18 and 25 years, with an average of 20.56 years (SD = 1.51). The distribution information of the gender and nationality can be found in Table 1.

Table 1:: Gender and nationality distribution

	Country		
Gender	Germany	Netherlands	Total
Male	10 (8.1%)	15 (12.1%)	25 (20.2%)
Female	58 (46.8%)	41 (33.1%)	99 (79.8%)
Total	68 (54.8%)	56 (45.2%)	124 (100%)

Procedure

The experiment started with the participants gathering in the room where the experiment was conducted. When the group of 3 or 4 people were complete, the session began. First, to get to know each other, four simple team building games were played. The first two games were get to know each other games, the third game involved trust and coordination and the final game was about creativity. The duration of this part was about 10 minutes. When the group was finished, the group cohesion was measured. After this short questionnaire, the main task began. Here the group had to develop a game, based on certain criteria which were given in the assignment. The time limit of this session is 20 minutes, after that, the results had to be presented. The final task for the participants was to fill in the questionnaire.

Team building games. A collection of 4 games is described on a piece of paper. The group had to do each item on the list from top to bottom. The only item they needed for the games is a tennis ball to throw at each other.

The first two games revolved around learning the names of the other team members. In the first game, the team members had to introduce themselves and in the second game it was about practicing the names. The third game is a task that

requires trust and coordination to be completed. During this game the members had to stand in a circle and face each others back. The final goal of this game was to sit on each others laps. As final game combines creativity and knowledge, a series of country and city had to be stated alternately.

Group Cohesion Measure. After the Team building games, the group cohesion was measured. This short questionnaire will described in-depth in the cohesion paragraph of the Measurements section.

Group task. The participants were standing around a round table and got one assignment (see Appendix A), one whiteboard and one marker. In addition each participant was given one piece of plain paper and a pencil. The assignment described a illness, a therapy and a goal. The goal was to develop at least 2 games that meet the requirements of the therapy in such a way that the therapy gets more interesting for 7 to 10 year olds. After the development session one team member had to give a short presentation of the results.

Measurements. The final measure consisted of 6 standardized and validated scales from different questionnaires. More details of these questionnaires can be found in the Measurements section.

Measures

In the analysis consists of five kind of variables. 1) The introspection scales for dominance, measured as Assertivity, Self Esteem and Sociable Dominance Scale. 2) The observed scale for dominance, measured by the observations of the team members, labeled as Team Member Dominance. 3) The ranked observations for dominance and leadership. 4) The observed initiative taking scales Walking, Ball, Paper and Ball. 5) The demographic variables age and length.

Dominance.

Assertiveness This scale contains only the items from the MMPI dominance scale. A translation to a Dutch version is used (Derksen & de Mey, 1997). This 25 dichotomous item (0 = disagree, 1 = agree) test measures the personality trait dominance. This questionnaire is frequently used in mental health. An example question is 'I definitely have a lack of self confidence'.

Self Esteem The dominance scale from this Dutch Personality Inventory measures: initiative taking, managing other people and self-confidence within a group. The scale consists of 17 yes-no items, with reported Cronbach's alphas between the .70 and the .80. An example question is 'Within a group, I am mostly in charge' (Luteijn, Starren, & van Dijk, 2000). The test is stable over time, over a time span of 28 months a correlation is reported of r=.72 (Luteijn et al., 2000).

Sociable Dominance This scale measures the dominance, expressed in social activity and attention in 8 questions on a 5-point scale. A higher score indicates a better relationship with the group members, and higher probability to be leader (Kalma et al., 1993). An example question from this scale is 'I have no problems talking in front of a group'. In other research, a Cronbach's alpha of .79 is found (Kalma et al., 1993).

Team Member Dominance Compared to the previous three scales, which are introspective scales, this scale uses context information. The team members give their opinion about each individual team member. This scale consists of 10 items. Each item consists of an adjective pair where one of the items is the inverse of the other and had the be scored on a 5-point scale. An example pair is 'dynamic - passive' (Manusov, 2005).

Ranking Each group member is asked to make a ranking of the level of dominance of all members (including himself). Since the focus of this study is on leadership and not on peck order, the most dominant person is ranked as 1 and all the others as 0. This is on basis of the relation between leadership and dominance, as suggested in the literature.

To extend this measure, a distinction could be made by dividing ten dominance points over all group members. More points given indicates a higher level of dominance. By dividing points, the difference of perceived leadership can be shown. To determine the perception of leadership it is also asked to make a ranking of group leadership. The variables are respectively called Dominance Rank (DRank), Dominance Points (DPoints), Leadership Rank (LRank).

Group atmosphere.

Group Cohesion Group atmosphere is assessed, with the Cohesion scale from the Revised Substitute for Leadership, which measures the perception of group cohesion (Podsakoff, Niehoff, MacKenzie, & Williams, 1993). This scale consists of six items using a 5-point likert scale (1 = completely disagree to 5 = completely agree). A sample question is 'Members of my group work as a team'. This scale is measured twice, the first time was right after the team building games.

Group Climate Questionnaire The group atmosphere is measured using 12 items, divided over 3 subscales, and are scored on a 5-point likert scale (1 = completely disagree to 5 = completely agree). Here, group atmosphere is divided in: engagement, conflict and avoiding. A sample question from the (engagement)-scale is 'The members liked and cared about each other'. A Cronbach's alpha of .877 is reported (Whittingham, 2007).

Initiative Taking.

Initiative taking The Initiative taking task was assessed by observation. From 5 different angles, recordings of the session have been show for interpretation. Each recording had a length between 10 and 30 seconds. Of all team members a ranking (1 = First to take initiative, 2 = Second to take initiative, etc.) had to be made of who first started walking, picked up the ball, interacted with the paper and the first one who started reading.

For these rankings, the same method is applied as for the rankings of Dominance and Leadership. The ranked leader gets score 1, and all the others get score 0.

The actions are formally defined as;

- Walking: The participants are standing with their back against a wall. The first person that starts walking towards the instruction paper and the ball will be ranked as 1. All the other people get score 0.
- Ball: The ball lies on top of the instruction paper. The first person who picks up the ball to move it or to hold it in their hands will be ranked as 1.
- Paper: The paper lies in the middle of the room with a ball on top of it. The first person who picks up the paper is ranked as 1. When the paper is not picked up,

the first person who moves or rotates the paper for an optimal view will be ranked as 1.

• Reading: Two cases are possible. The first case, if someone picks up the paper and starts reading out loud to the other people, this reader gets ranked 1. In the other case, the person who first is the first to be able to read and reads the text gets ranked as 1.

The video recordings are ranked, as described above, by 5 people. Based on the scores of the rankers, the Intraclass Correlation Coefficient (ICC) is calculated. This measures the reliability between 2 or more observers (Shrout & Fleiss, 1979). This can be seen as a generalization of Cohen's Kappa.

To make a single measure of a person, from multiple measurements, the most common value is taken. Thus, as the collection of values looks like $\{1, 2, 1, 1, 1\}$, this will result in a 1. In case of an inconclusive measure, the result will be deduced based upon of the conclusion of the other participants.

Analysis

The first step in the analysis is to describe the statistics for the Dominance scales: Assertiveness, Self Esteem, Sociable Dominance and Team Member Dominance. As a second step, the Intraclass Correlation Coefficient is calculated as a measure of agreement between the observers. When the information about the reliability of the measures is known, the correlations between them will be calculated. With these correlations, the different types of measurement can be compared. In the final step one value is taken as yard-stick and compared with the other values. Based on this measure predictabilities are calculated.

Results

The descriptive statistics are shown in Table 2. Both the Self Esteem and the Assertiveness score are below half of the scale score (.5). The same applies for the Sociable Dominance, which is with 2.69 a little on the low side. In comparison, the Team Member Dominance on average shows a higher score. The alpha value of the Self Esteem is quite low. The scale will not be deleted, but this needs to be taken into account when interpreting the data.

Table 2:: Descriptive Statistics for al measures (N=124)

Questionnaire	Mean	SD	Alpha
Assertivity	.34	.18	.77
Self Esteem	.41	.17	.55
Sociable Dominance	2.69	.64	.76
Team Member Dominance	3.33	.57	.99

Observers The Inter-rater reliability is calculated over the five observers (intraclass correlation coefficient = .85, $p < .0001$). In total, 432 measures for each rater are compared.

Correlations The correlations are divided into two parts. In the first part, the variables that belong together in a construct are described. In the second part, the different constructs are compared with each other.

Correlations within a group variables Table 3 shows the variables for Dominance and Initiative traits. The Dominance variables, measured by Introspection, show a significant correlation with each other ranging from $r = .255$ to $r = .412$. When including TMD, this correlates two out of three times.

The ranked values of dominance and leadership from the team members show high correlations. The correlations range from $r = .693$ to $r = .816$. High correlations are also found in Initiative Taking, except for Walking. Walking is correlated with the other variables, but is much lower correlated than the others. The correlation cooffients range between .187 and .201.

The Introspection variables are also dichotomized. The person with the highest score is assumed to be leader and ranked 1, while the others are ranked 0. The correlations are recalculated and shown in Table 4. This table shows that the strength of the correlations decline for the Introspection construct. Although, new correlations are found for (Reading - Assertivity) and (Sociable Dominance - Paper).

The variable Team Member Dominance is composed of ten pairs and correlates both with Introspection and Ranking and only with Walking from the observed Initiative. After decomposing the Team Member Dominance variable to its original

variables, almost every (sub)-variable correlates significant with one another. The only exceptions here are (Dominance - Submissive) and (Aggressive - Meek), see Table 8.

In the Classical Game Theory is stated that taking initiative in situations can benefit you. In the final measure has been asked to state three characteristics of the leader. Of the 124 participants, 26 of them said that initiative taking was one of the leadership characteristics for the leader of their group.

Correlations between grouped variables The grouped variables correlate with each other; this indicates that these variables somehow measure the same. When making the comparison between the grouped variables, there is not a single correlation found between the Introspective Dominance reports and the Rankings and the observed Initiative taking.

The decomposed values of Team Member Dominance, as shown in Table 8, show only one correlation with the introspection variable Assertivity. All the others are not correlated. Other correlations are found in Ranking (Confident - Unconfident). Ball and Reading are correlated with (Talkative - Silent). A visual representation of the correlations between TMD, TMD-decomposed, Introspection and Rankings is shown in Figure 1.

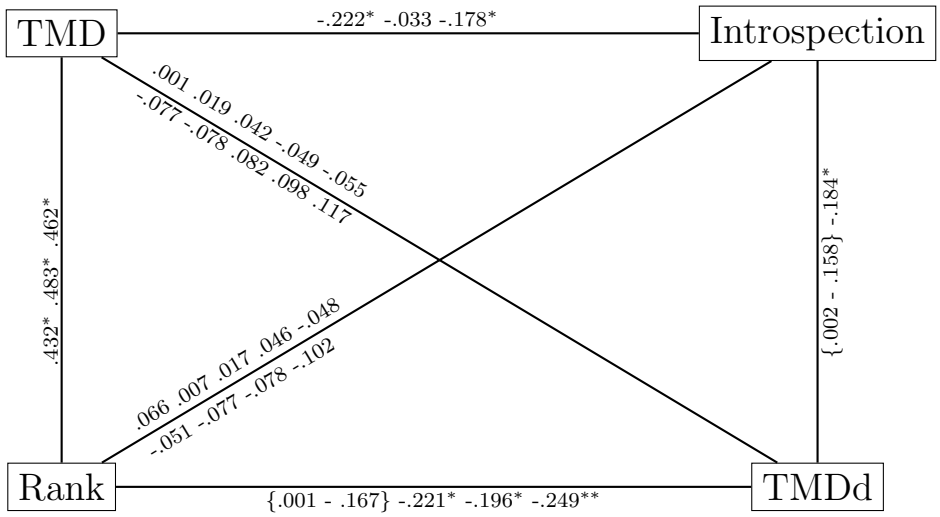


Figure 1. : Visual correlational overview for TMD, TMD-decomposed, Introspection and Rankings. The numbers represent the r = Pearson Correlation Coefficients.

The Rankings correlate well with Initiative taking. The highest rankings are found for Walking and for the Dominance Rank. The only exception can be found between Leadership Points and Reading, these categories are not correlated. Although Leadership points did not show the strongest correlations to the other variables, this value is chosen as yardstick. The reason for this is a 100% match with the answer of the question: "Who is the leader of the group?".

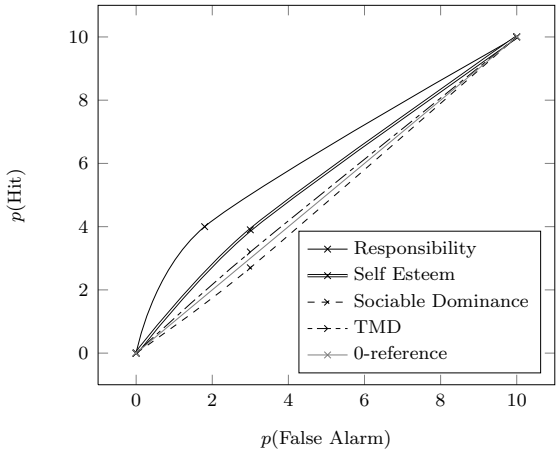
Quantification It is known from Table 3 what the strength of the correlations with the yardstick (Leadership Points) are. In order to create an interpretation that is more self-evident, the true positives (hit rate), false positives (false alarm) and accuracy are calculated. These values between 0 and 1 are metric measures of performance and could be interpreted as a chance. Besides this, they are useful in the construction of a Receiver operating characteristic curve (ROC-curve).

The values needed for the construction of a ROC can be easily calculated using a contingency table; the structure of this table is shown in Table 5. Where the true positive rate, or the precision of the measure, is defined as $a/(a+c)$, the false positive rate or fallout as $b/(b+d)$ and accuracy as $a+d/(n)$. The results are shown in Table 6, where the yardstick is Leadership Points.

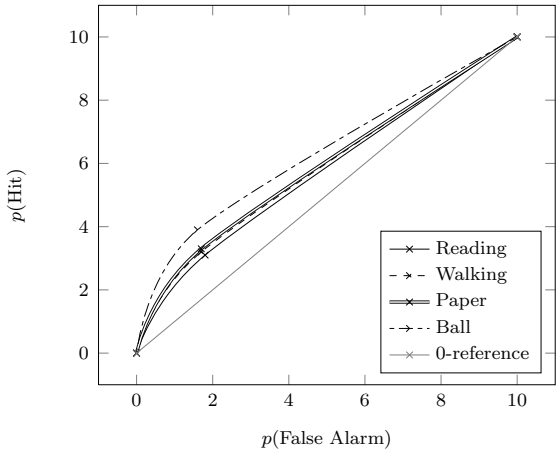
When constructing a ROC-curve, the 'area under the curve' (AUC) can be calculated. This area is an estimation of the ability to the measure to correctly classify leaders and non leaders. In an ROC-curve there is a diagonal line that shows the 50% rate (Figure 2). The data shown in Table 4 shows 1 negative correlation for the variable Leadership Points in combination with Sociable dominance. This results in Table 6 in a value below the 0.5. This results in a chance that is below the random guess rate, see Figure 2. The figure also shows that Dominance Points is the best predictor in this study. The predictive power of the Initiative variables Walking and Paper is small, but bigger than the other variables.

Discussion

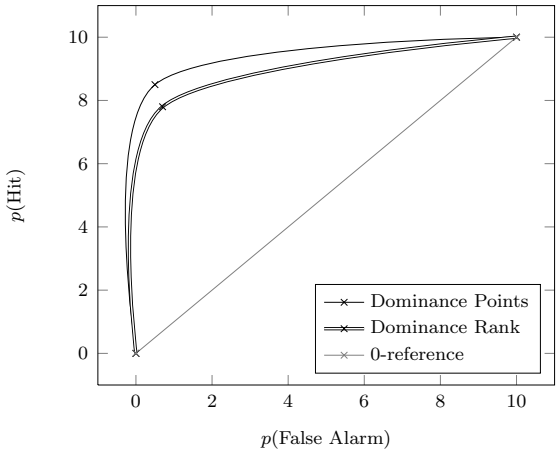
The results show that correlation between the different Introspective questionnaires are significant. This means they measure all some kind of the same. Previous research found relations between leadership and dominance, this relation is also found in this study. This relation is not found between the introspective measures of dominance and ranked Leadership. An explanation of this could be that the yardstick is a



(a) Introspection



(b) Initiative



(c) Ranking

Figure 2. : Receiver Operating Characteristic of the relationship between Leadership Points and other variables

measure of Leadership instead of Dominance. On the other hand, the results for the Dominance ranks show no improvement compared to the yardstick. There neither has been found a correlation found between Observed Dominance and the Introspective Dominance measure. It can be concluded that the observed dominance is different from the introspective dominance as used in clinical settings. What causes the lack of correlation? It could be caused by the self-selection bias. The majority of the participants was desperate for participant points, which could be earned by participating in this study. The participating students selected themselves and thereby removed

the diversity of the population participating in the study. An other cause could be a difficulty in measuring leadership through a questionnaire. There are two phenomena that could be the cause of this. In the first case, the central tendency bias, extreme scores are avoided. On a 5-point Likert scale, the scores 2-4 are more preferred than 1 and 5. In the second case, social desirability could be the underlying cause. Certain answers will be more desirable, instead of representing the truth. Could this lack of correlation be caused by the introduction of a new variable, context. Does this context have an influence on the behaviour of people? This could be the case, the literature shows that the roles within small self formed informal groups are dynamic and any member of the group could become a leader (Côté et al., 2010).

In the search for visual observable behavior, initiative taking can be seen as an indicator for perceived group leadership. This is in line with the literature and the Classical Game Theory (Van Vugt, 2006). The Walking action is a strong predictor for both leadership and dominance, as measured by the observation by the other group members.

The expected relation between (Dominance - Submissive) and both Observed and Introspection measures of Dominance, was not found. Perhaps the trait Dominance is too general for predicting leadership, and there should be a focus on more specific variables. Decomposition of the Team Member Dominance variable suggests that the variables Confidence and Outgoing predict the Dominance and Leadership perception.

In this study is assumed that the yardstick for leadership is the observation of leadership by the team members. On the other hand it is assumed that this is the person who takes the most initiative. Is this the main reason to select a person as group leader? The statistical analysis shows the existence of the relation, but was this also the reason of the team members? A short overview of the measure shows that 26 of the 124 participants state that initiative taking is one of the three characteristics of their choice for a group leader. This is only a short observation and is not statistically analyzed. This could be a topic for future research.

The Introspection measures of dominance are not suitable for finding a leader in this context. The TMD variable shows a significant correlation with the yardstick, Leadership points. Perhaps it is better to use TMD as a predictor for leadership, but this measure does not measure by introspection and this is context-dependent.

Is the context the real cause of the results or is there a fundamental error in con-

struction of the groups, used in the experiment? Are these groups too heterogeneous? The initial plan was to form groups of four members of the same sex, nationality, who don't know each other and around the same age. It was not feasible to gather such a group within the time available for the experiment. This resulted in groups that are not in line with the assumed group composition. This could have an impact on the results. In the case of a group of four very close friends participating in the experiment, it is difficult to see how leadership within that group emerges. They know each other very well beforehand and leadership can be influenced by earlier uncontrolled events.

The lack of correlation between the decomposed values of TMD and the Introspection Construct is interesting. In the Introspection construct are 3 measures of dominance, which are weakly correlated with the TMD. After decomposition, the correlations disappear. For a better interpretation, see Figure 1. This figure shows that TMD correlates with the Introspection variables and with the Rankings. But the Introspection does not correlate with the Rankings. If this is caused by context, does this also explain why there is no relation between the TMD and the values of its decomposed version? And why are there only three correlations found between the decomposed TMD variables and the Rankings.

To conclude can be said that Initiative taking is a predictor for leadership. The results show the best correlations for walking and paper. To generalize this, it can be said that if someone sees the importance of a task and reacts to it, the chance of becoming a leader increases.

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Appendix

Assingment

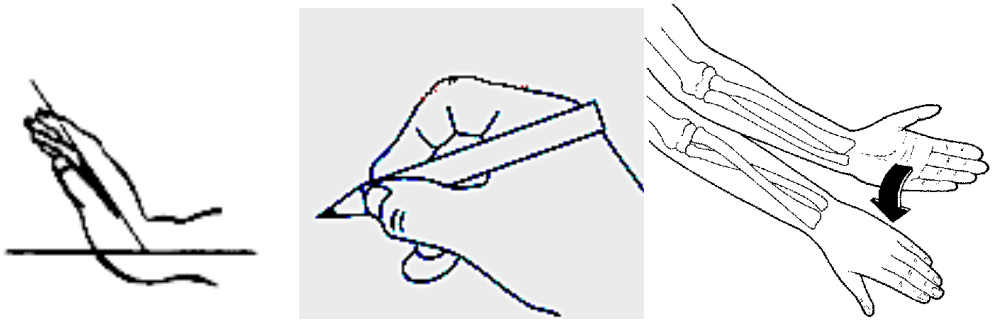
`Expriment Description`, 2 pages

Experiment Description

Cerebral Paresis is an umbrella term for a group of disorders which result in a disorder of posture and or motor function. This is due to a permanent abnormality in the brain, caused in the first year of life. The prevalence of Cerebral Paresis is two till three occurrences per 1000 children, twice as much compared to Down Syndrome. Cerebral Paresis is the most common motor deficiency in early childhood. One of the symptoms of Cerebral Paresis is an above average muscle tension in the hand and arm (Cans, 2000).

Unfortunately, Cerebral Paresis can not be healed, but surgery and therapy can help to improve the abilities of the patients. The so-called modified Constraint Induced Movement Therapy (mCIMT) makes uses of the training joints in the arms and hands (Gordon, Charles, & Wolf, 2005). This therapy focusses on three types of movements:

- Dorsal flexion in the wrist (move the back of the hand to the arm).
- Pincer grasp (pick things up between you thumb and index finger).
- Supination and Pronation (rotate the the hand).



(a) Dorsal flexion (b) Pincer grasp (c) Supination

Figure 1: Training movements

Although this therapy is effective, a lot of repetitions in an exercise is not stimulating for children and a negative attitude can be developed against the treatment. For motivational purposes, the use of games can be used to make the treatment more interesting and pleasant for children.

The objective is develop at least two games that are suitable for children in the age category 7-10 years. These games should train the movements that fit the treatment of Cerebral Paresis, as show in Figure 1. The duration of this session is 30 minutes. Five minutes before the end I'll notice you with a buzzer. At the end of this session one of you has to give a short presentation of the games/findings. This presentation, should per game at least include why this game fits the treatment, why this game is preferred over the normal treatment, the materials that are needed to play this game. You can use the big paper to make some kind of a presentation and visualise your ideas. The duration of the presentation should not take longer than 2 or 3 minutes.

Good luck

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Table 3:: Correlations for all measures (N=124).

Trait	Dominance							Initiative					
Construct	Introspection			Observe	Ranking								
Variable	Resp	SE	SD	TMD	DRank	DPoint	LPoint	Walking	Paper	Ball	Reading	Age	Length
Assertivity	1	.412**	.322**	−.222*	−.077	−.102	.006	−.010	−.086	−.090	−.089	.070	.130
Self Esteem		1	−.255**	−.033	−.051	−.078	.007	.070	.175	.146	.106	.148	.163
Sociable Dominance			1	−.178*	.017	−.046	−.048	.096	−.135	−.123	−.068	−.088	−.038
Team Member Dom				1	.432**	.483**	.462**	.222*	.089	.099	.147	.013	.073
Dominance Rank					1	.794**	.693**	.346**	.276**	.305**	.346**	.081	.048
Dominance Points						1	.816**	.213*	.182*	.213*	.213*	.081	.102
Leadership Points							1	.245**	.218*	.202*	.158	.110	.102
Walking								1	.201*	.187*	.195*	−.052	.061
Paper									1	.922**	.754**	−.025	.110
Ball										1	.830**	−.018	.119
Reading											1	−.092	.077
Age												1	.198*
Length													1

Notes: $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Table 4:: Correlations for all measures (N=124).

Trait	Dominance							Initiative					
Construct	Introspection			Observe	Ranking								
Variable	Resp	SE	SD	TMD	DRank	DPoint	LPoint	Walking	Paper	Ball	Reading	Age	Length
Responsibility	1	−.022	.207*	.207*	−.093	−.093	.051	−.063	−.145	−.156	−.231**	.050	.054
Self Esteem		1	−.192*	.040	.014	.053	.079	.012	.026	.011	.054	.078	.068
Sociable Dominance			1	−.094	.080	−.002	−.054	.070	−.200*	−.164	−.061	−.144	.008
Team Member Dom				1	−.125	−.084	.027	−.149	.032	.019	−.061	.073	−.142
Dominance Rank					1	.794**	.693**	.346**	.276**	.305**	.346**	.081	.048
Dominance Points						1	.816**	.213*	.182*	.213*	.213*	.081	.102
Leadership Points							1	.245**	.218*	.202*	.158	.110	.102
Walking								1	.201*	.187*	.195*	−.052	.061
Paper									1	.922**	.754**	−.025	.110
Ball										1	.830**	−.018	.119
Reading											1	−.092	.077
Age												1	.198*
Length													1

Notes: $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Table 5:: Contingency Table Structure

Event forecast	*Event Observed*		
	Yes	No	Marginal total
Yes	a	b	a+b
No	c	d	c+d
Marginal total	a+c	b+d	a+b+c+d = n

Table 6:: Contingency table results

Questionnaire	TPR	FPR	ACC	AUC
Self Esteem	.741	.643	.605	.526
Responsibility	.750	.675	.613	.541
Sociable Dominance	.711	.765	.581	.473
Team Member Dominance	.733	.706	.613	.514
Dominance Rank	.912	.509	.757	.843
Dominance Points	.945	.121	.927	.904
Walking	.784	.514	.718	.613
Paper	.772	.522	.718	.595
Ball	.770	.542	.710	.590
Reading	.763	.593	.685	.573

Table 8:: Correlations Introspection Trait and TMD decomposed (N=124).

	Resp	SE	SD	TMD	1	2	3	4	5	6	7	8	9	10
Assertivity	1	.412**	.322**	−.222*	.133	.017	.116	−.044	−.005	−.184*	.025	−.031	.021	−.070
Self Esteem		1	−.255**	−.033	.016	−.077	.050	−.070	−.002	−.089	−.018	.039	−.022	−.066
Sociable Dominance			1	−.178*	.014	−.094	−.143	−.132	−.120	−.022	−.081	−.158	−.086	−.135
Team Member Dom				1	−.049	−.055	.098	.082	−.078	.117	.019	−.077	.001	.042
1. (Dominant - Submissive)					1	.361**	.038	.103	.131	.089	.201*	.132	.137	.134
2. (Confident - Unconfident)						1	.307**	.368**	.464**	.211*	.502**	.454**	.501**	.608**
3. (Low status - High Status)							1	.536**	.473**	−.255**	.157	.421**	.393**	.435**
4. (Sluggish - Energetic)								1	.586**	−.080	.363**	.504**	.568**	.532**
5. (Hesitant - Decisive)									1	−.013	.370**	.506**	.489**	.566**
6. (Aggressive - Meek)										1	.234**	−.054	.120	−.116
7. (Outgoing - Withdrawn)											1	.431**	.693**	.395**
8. (Silent - Talkative)												1	.501**	.588**
9. (Dynamic - Passive)													1	.459**
10. (Awkward - Poised)														1

Notes: $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$