Does team building lead to better performing teams?

The influence of a team building exercise on team communication, cohesion and task performance

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Abstract

This paper presents a four step plan to objectively measure the effects of a ‘team building activity’ on ‘organizational outcomes’ via ‘effective team aspects’ that will be measured as ‘team outcomes’. These steps are applied to the experiment conducted in this paper. In this experiment the impact of giving a newly formed team a ‘LSD mini lecture’ on ‘return of investment’ is investigated. The experiment has an experimental condition in which participants do get the ‘LSD mini lecture’ manipulation and a control condition in which they do not get this manipulation. In both conditions the independent variables ‘communication’ and ‘cohesion’ are respectively measured by adapted versions of the ACP-360 and GCQ-23 questionnaire. The dependent variable ‘return of investment’ is measured as the costs per centimeter of height of a tower that the teams are asked to build. The final sample consisted of 49 teams (23 control condition, 26 experimental condition) with 3 participants per team. Results showed no difference in communication and cohesion per condition and no relation between communication, cohesion and return of investment. In conclusion we can say that our specific team building activity did not influence team communication, cohesion and task performance.
Introduction

Teams play an increasingly important role in people’s daily lives. As employee’s people often work in teams, in their spare time people play team sports or play team based computer games, even when they are doing volunteer work they probably work in a team. Every which way you look teams are being used to solve complex tasks (Nahavandi & Aranda, 1994; Shuffler, DiazGranados & Salas, 2011). This research paper focuses on teams in work organizations.

Work organizations typically see teams as a way to carry out complex tasks (Thompson, 2010). However not every team is quite as effective as the other team (Klein, et al., 2009). Year after year companies spend hundreds of billions of dollars on the training of their employees (TrainingIndustry, 2013). Not all of this money is spent on team building activities, but at least a vast amount is (Klein, et al., 2009). This brings up the question: What do companies get in return for this investment? Does team building actually lead to better performance and consequently a higher return on investment? This paper will make a start to answer this question, because unfortunately previous research cannot provide us with a clear answer as we will see.

Most of the previous research on the relationship between team building activities and team performance was conducted from the late seventies till the nineties (Klein, et al., 2009; Salas, Rozell, Mullen & Driskell, 1999; Shuffler, DiazGranados & Salas, 2011). Only quite recently Klein, et al. (2009) conducted a meta-analysis to try to get an answer to the question “Does team building result in positive outcomes?”. Although this meta-analysis gives some insight in the relationship between team building and team outcomes, it has some important limitations. But before these limitations will be discussed, it is important to first get a better understanding of the terms ‘teams’ and ‘team building’.
**Teams**

The term ‘team’ has already been used quite often in the introduction, but what exactly is a team? One of the first clear definitions of a team is described by Dyer (1984) according to Salas, Bowers & Cannon-Bowers (1995). Dyer’s defines a team as two or more people, a common goal, specific role assignment, and interdependence. This definition was later somewhat rephrased and expanded by Salas, Dickinson, Converse & Tannenbaum (1992). They define a team as: "a distinguishable set of two or more people who interact, dynamically, interdependently, and adaptively toward a common and valued goal/objective/mission, who have each been assigned specific roles or functions to perform, and who have a limited life-span of membership" (p4). The latter definition is still widely used (Klein, et al., 2009) and will serve as a starting point for this paper, as will be described next.

For the purposes of this experiment a team is defined as two or more interdependent people with shared responsibilities who have a common goal. The aspect shared responsibility was added to the definition because in a team everyone must have influence and control over the end result. The only way you can achieve this is by making the team share the responsibility for this. This way individual members cannot hide behind each other’s backs. The limited life-span of membership aspect was left out of the original definition, because this is inherent to the experimental nature of our research. Lastly we decided to leave the aspects of specific roles or functions to perform out, because we do not see this as a necessity of being a team rather than being an effective team. What is seen as an effective team will be described next.

**Effective teams**

Previous research does not make clear a distinction between ‘teams’ and ‘effective teams’ (Klein, et al., 2009). In their review Shuffler, DiazGranados & Salas (2011) make a
first attempt to make this distinction. Unfortunately the distinction is still kept quit vague due to the use of very broad factors, making it not usable for this paper. Although no concrete distinction is made within the literature, this does however seems to be quite important. When you want a team to improve task performance through team building, it only seems logical that team building activities should intervene on aspects that make a team an effective team.

So, what makes for an effective team? In this paper we define an effective team as having the following aspects. An effective team must have ‘1. clear and specific goals’ (Antai-Otong, 1997), ‘2. clear role division’ (Whichard & Kees, 2006), ‘3. trust between team members’ (Mach, Dolan & Tzafrir, 2010; Webber, 2002), ‘4. good communication’ (Clutterbuck, 2007; Katzenback & Smith, 2003), ‘5. the right mix of Knowledge, Skills and Abilities (KSA)’ (Stevens & Campion, 1999) and finally ‘6. the right fit between team size and team goal’ (Driskell, Goodwin, Salas & O'Shea, 2006). The first aspect includes agreement on how to reach the goal plus team members must be motivated to put effort into accomplishing the goal. The second aspect includes the right mix of roles. For example, a team will probably not be effective when all team members are mainly creative and can come up with a lot of great new ideas when you have no one in the team that is the do-er and is going to bring the ideas into practice. This aspect also includes a formal or informal leader. The fourth aspect includes clear and open communication, feedback and how to make decisions. The fifth aspect means that the more team members have the right KSA’s to work as a team, the more they are able to use these KSA’s and the more effective the team can be. Lastly the sixth aspects means that a certain task should be performed with the least amount of people possible, but still in line with the goal. For example if the team goal is to make as much chairs of high quality as possible, it typically it takes 10 people to do this task. This means that it is not more effective to let 8 people do this task, because the quality will drop. But it should not be done with 11 people either because this will create more overhead.
Team building

Now that the terms ‘team’ and ‘effective team’ are defined for this paper, the concept of team building can be introduced. Team building is something that companies use to try to improve team performance. One team building definition that is often used is “A group-process intervention designed to improve interpersonal relations and social interactions” (Salas, Rozell, Mullen & Driskell, 1999). Later on this definition was expanded to include “achievement of results, the meeting of goals, and the accomplishment of tasks” (Dyer, as cited in Shuffler, DiazGranados & Salas, 2011). Looking at previous research on team building you will often come across the term team training. Team training is related to team building, but focuses on different aspects (Delise, Allen Gorman, Brooks, Rentsch & Steele-Johnson, 2010). Team building focuses on solving a problem within an existing team (Shuffler, DiazGranados & Salas, 2011). This is done mainly by goal setting, interpersonal relationship management, role clarification and problem solving (Buller & Bell, 1986). Team training can be seen as the KSA’s that are needed to function in and as a team (Salas & Cannon-Bowers, as cited in Shuffler, DiazGranados & Salas, 2011). So the overall idea behind companies investing in team building and team training is to make teams more effective by developing these aspects. They hope this will lead to better team performance which hopefully leads to more profit. In this paper team building is defined quite literally as building a team. To build a team you need all the aspects from both the team building and team training definitions as described above. So for the experiment described in this paper team building is seen as a combination of team building and team training.

Limitations of previous research

Now that the terms ‘team’ and ‘team building’ are described by their original definition and are described as how they must be seen within the context of the experiment in this paper, we can get back to the start of this article. At the start of this paper it was described
that Klein, et al. (2009) did a meta-analysis on the relation between team building and team outcomes. They categorize team building interventions into ‘goal setting’, ‘interpersonal relationships’, ‘role clarification’ and ‘problem solving’. The team outcomes are categorized into ‘cognitive’, ‘affective’, ‘process’ and ‘performance’. They find a positive moderate effect of team building in general on team outcomes in general. The strongest effects of team building in general are found on affective and process outcomes. The strongest effects on team outcomes in general are caused by goal setting and role clarification. The effects of team training are summarized by Shuffler, DiazGranados & Salas (2011). These results show that team training also has a positive effect on all team outcomes, however on affective outcomes it is better to use team building because this has a larger effect. A visual representation of these results can be found in figure 1, where team development is used as an umbrella term for the original definitions of team building and team training.

**Figure 1.** Team building aspects that influence team outcomes.

In the introduction it was mentioned that the research by Klein, et al. (2009) had some important limitations. One of the main issues is that team outcomes are measured subjectively. For example affective outcomes are measured based on the interpretation of a team supervisor, leaving a lot of room for interpretation. Furthermore the different types of team outcomes are only globally defined, if defined at all. Another shortcoming of the team outcomes, is that these are listed as four separate, unrelated types of outcomes. Where it is much more likely that these outcomes are at least in some way related. From other research it could for example be inferred that affective outcomes influence performance outcomes.
(Mach, Dolan & Tzafrir, 2010). Lastly, the relation between team building activities and the (possible) influence of these activities on the different team development aspects is often unclear. With this much room for interpretation and uncertainly it is almost impossible to translate a team building activity to monetary gains for an organization. This leaves organizations that want to invest in team building with little research to draw from to decide if this is the right choice for them.

Proposed steps for measuring team building effectivity

In the previous paragraph it became clear that previous research on team building has some limitations. To summarize, the relation between team building activities and team development aspects are unclear. Some team development aspects are very abstract and not defined. Furthermore team outcomes are measured subjectively and are often not defined. Finally, because of the subjective and undefined nature of the team outcomes it is unclear if and to what extent team building will lead to monetary gains for an organization. Given these limitations and the new definitions of ‘teams’, ‘effective teams’ and ‘team building’ as described earlier, we propose four new steps to objectively measure the effects of team building. These new steps are ‘Team building activities’, ‘Effective team aspects’, ‘Team outcomes’ and ‘Organizational outcomes’ and describe the whole team building effectivity process, as can be seen in figure 2. The dotted bullet points in figure 2 suggest that there are more factors, but it is not within the scope of this paper to explore all possible factors. The factors illustrated in light grey are the factors that will be tested in this paper. In the first step the concrete team building activities will be described. In the second step it will be described on what effective team aspect(s) the teambuilding activity will intervene on. The effective team aspects that are listed in figure 2 are the ‘effective team’ factors that were defined earlier on in the paragraph ‘Effective teams’. In the third step it will be described how which (sub)aspects of effective team aspects will be objectively measured. In the fourth and last step
it will be described which organizational outcome will be measured objectively and how which organizational outcome is related to which team outcome(s).

**Figure 2.** Proposed steps for measuring team building effectivity.

**Factors being researched using the four new steps**

As mentioned in the previous paragraph only a few factors within will be researched within the scope of this paper using the new four steps. After consulting a field expert in team building (R.C. Smeets, personal communication, November 5, 2013) it became clear that communication and cohesion problems often arise in daily practice. Research suggests that team communication and team cohesion have a positive effect on team performance (Beal, Cohen, Burke & McLendon, 2003; Carron, Colman & Wheeler, 2002; Stout, Cannon-Bowers & Salas, 1999). Although it has not been done before in a teambuilding context, team communication and team cohesion can be measured objectively perfectly well. Since these issues have the interest of the researchers, these factors will be the main focus of the experiment. Note that the factors cohesion and communication might perfectly well function as a sub factor of what is presented in the old model (figure 1) as ‘affective outcomes’. At this point we will not categorize the (sub)factors yet because a more extensive list of possible team outcomes is needed first.

Given that the team outcomes cohesion and communication will be the main focus of this paper, it is possible to reason back and forward through the team building effectivity steps as illustrated in figure 2. We expect that team outcomes ‘cohesion’ and ‘communication’ will increase. Reasoning backwards these team outcomes can be seen as part of the effective team
aspect ‘good communication’. To improve ‘good communication’ we came up with the team building activity ‘Luisteren, Samenvatten, Doorvragen (LSD) mini lecture’. This activity in English loosely translates to ‘Listening, Summarizing, Asking follow-up questions’. We expect this activity to improve ‘communication’ and ‘cohesion’ as objectively measurable factors of ‘good communication’. Reasoning forwards we expect that higher ‘cohesion’ and higher ‘communication’ will lead to a higher ‘return of investment (ROI)’ as ‘organizational outcome’. For the experiment in this paper, participants will be asked to build a tower as high as possible at the lowest possible price. Return of investment will be measured as the costs per centimeter of tower height. So we expect the higher the cohesion and communication, the lower the costs per centimeter of height. This forward and backward reasoning leads to the following hypotheses.

Hypothesis 1: There is a positive relation between receiving the LSD mini lecture and communication.
Hypothesis 2: There is a positive relation between receiving the LSD mini lecture and cohesion.
Hypothesis 3: There is a positive relation between communication and ROI.
Hypothesis 4: There is a positive relation between cohesion and ROI.
Hypothesis 5: There is a positive relation between receiving the LSD mini lecture and ROI.

Method

Sample

We conducted our study at the University of Tilburg, the Netherlands. Participants are students at this university and are required to have a good understanding of the Dutch language. To recruit students this study was introduced into the university system that is in place to let first year psychology students get course credit for participating in research. At
first mainly first year students were invited through Facebook groups to sign up for this study. They were also recruited by handing out flyers, inviting them to sign up for this study, at mandatory first year psychology lectures. Next all psychology students were targeted by handing out flyers of the experiment at the canteen in the psychology building. Lastly all students from the university were targeted by handing out flyers at the common campus canteen and by approaching students walking around the campus. Upon registering in the university system students were free to choose a time and date that fit their schedule. The system also allowed students to see how many participants already signed up for a certain time and date, since we need exactly three students to run the experiment. Students are made aware that exactly three students are needed for the experiment to be able to take place before they sign up. In the unfortunate event that a session could not take place because not enough participants signed up, students would be informed of this at least a day in advance by email. Students received an incentive to take part in the experiment in the form of course credit or 8 euro.

In total 183 students participated in the experiment. Twelve teams of three students had to be removed from the sample because they did not complete the task successfully in which the dependent variable was measured. The final sample comprised 147 students, from 16 different fields of study. For the most part these are psychology students (83.67%). The larger part of the sample are women (78.2%) and the average age is 19.93 years ($SD = 2.05$). One session of the experiment is carried out by one team of three people. This means that 49 groups of students are included in our final sample.

**Research design / Procedure**

The experiment that is conducted has a between subjects design. Sessions of the experiment are alternated between the control condition ($n = 23$) and the experimental condition ($n = 26$). The difference in the number of groups per condition can be explained by
not alternating correctly. A session takes around 50 to 60 minutes, depending on the speed at which the teams accomplish their given tasks. At the start of each session the participants will be asked agree to with our online consent form, using the Qualtrics web services. The consent form informs participants about their rights and about what is expected of them, for the exact contents see Appendix A. At the end of each session the participants will be informed online in writing, using the Qualtrics web services, about the actual idea behind the experiment, for the exact contents see Appendix B.

**Control condition.** In the control condition the participants will go through five different activities. A description of these activities will be given next with the theoretical reason for each activity. For exact instructions of the activities please see Appendix C.

The first activity is the ‘Introduction’. In this activity the participants will be welcomed by the experimenter. The experimenter will give some general information like a very global idea behind the experiment (sort of cover story), the time the experiment will take and the experimenter will ask the participants to imagine that they are recruited as a team of three people by a large company. This company expects them to perform the tasks to come as best they can. The reason for this is that we want to get as close as possible to a real life setting within the experiment. This activity will take about two minutes.

The second activity is called the ‘Ball throwing game’ and is a team forming exercise. In this activity participants will learn each other’s names and some hobbies, sports or interests of their fellow team members. Participants are asked to stand in a circle. In the first phase of the game the participants will throw the ball around in a fast pace. The participant who currently has the ball will say aloud his own name and a hobby, sport, or interest that characterizes himself. Next the ball will be thrown to another team member who does the same thing. This process is repeated till every team member has done this seven times. The participants are instructed to try to remember each other’s characterizations as best they can,
because this is important for the next phase. In phase two the participant who currently has the ball will state both names of the other two team members. Of the team member who is named last the participant who currently has the ball will also say aloud a characterizations and will finally throw the ball to this person. This process is repeated till all characterizations have passed or until no more characterizations can be remembered. The reason for this activity is that due to the nature of the experiment we work with newly formed teams that have not worked with each other before. Before a group of individuals work as a team they go through different stages. The most commonly used stages (Gilley, Morris, Waite, Coates & Veliquette, 2010) are ‘forming’, ‘storming’, ‘norming’, ‘performing’ and ‘adjourning’ (Tuckman, & Jensen, 1977). Newly formed teams start in the forming stage where individuals typically have feelings of anxiety, mutual trust is low, members do not express their ideas and opinions and purposes and goals of the group are unclear (Gilley & Boughton as cited in Gilley et al., 2010; Tuckman & Jensen, 1977). An important way to make a group of individuals feel more as a team, and to overcome these unproductive feelings is by learning about other group members (Weaver & Farrell as cited in Gilley et al., 2010). This is exactly what this activity will accomplish. Group members get to know each other a little bit better in a casual way, bringing them one step closer to being a team. The other stages will be discussed in the activities to come. This activity will take about eight minutes and is extended compared to the experimental condition. The reason for this is that we want to keep the two conditions the same as much as possible. Since the manipulation activity cannot be included in the control condition, we have to fill this time gap. The time that the participants spent together is an important factor in making them feel like a team (Gilley, et al., 2010; Thompson, 2010).

The third activity is called ‘Map of the world game’. In this activity the participants will get to know one another even more, continuing the line that was set in the previous activity. The participants are asked to image a map of either the Netherlands or the world on
the ground, dependent on the life event. Next the participants will be asked questions regarding life events. For example “Where were you born?” or “Where do you live?” The participants are asked to walk to this place on the imaginary map and freely tell the other team member something about either the life event, the place where it took place, or both. Participants take turns and will be asked to tell something about six life events. The reason for this activity is the same as the previous activity; to let the group members form a team by getting to know each other. This activity will take about 15 minutes and is extended compared to the experimental condition for the same reason as activity two.

The fourth activity is called the ‘Blindfold rope task’. In this activity the participants will work together for the first time. The participants are asked to stand in a circle and will be shown a figure. Next they will be asked to recreate this figure on the ground with a rope that is a couple of meters long, while they are blindfolded. The reason for this activity is that we want to establish a baseline of team communication and cohesion with the questionnaires in the next activity. For this to be possible the participants needs to accomplish a task as a team first. In the description of the second activity the team stages of development by Tuckman & Jensen (1977) were introduced. The forming stage has already been established in the second and third task. The next stage is called the storming stage. In this stage the team gets to work. During this work process it will become apparent that different ideas, approaches and work styles from different team members compete for consideration. This way the group can develop role identity, expectations and establish how they will work together (Tuckman & Jensen, 1977). This is exactly what the fourth activity tries to accomplish; the team gets a clear task but they have to figure out themselves how to solve this task. This activity will take about 5 minutes.

The fifth activity is called ‘Questionnaires’. The participants will be asked to fill out a small online questionnaire. The reason for this activity is to measure the independent
variables communication and cohesion. Participants will not be made aware of this since this could possibly influence the remainder of the experiment. This activity will take about 7 minutes.

The sixth and last activity for the control condition is called the ‘Marshmallow challenge’. The team of participants is instructed to build a tower as high as possible for the least amount of money. The tower must stand on its own and be able to hold the weight of a marshmallow on top of it. The team will get a fictional budget of 50,000 euro. With this budget they can buy materials to build the tower. These materials are pieces of spaghetti (~25 cm), pieces of rope (~20 cm) and pieces of tape (~8 cm). Each piece of material costs 500 euro. The team will get the marshmallow for free. Each individual member of the team will get one type of material assigned that only they can buy. During the activity the experimenter will keep track of the budget. At the end of the activity the height of the tower will be measured and written down along with the amount of materials used. The reason for this activity is to measure the dependent variable return of investment. Activity two and four made mention of the forming and storming stages of team development. Due to the limited time this team spends together we do not expect the team to completely develop role identity, expectations and a way of working in the storming stage of activity four. If this would have been the case, this would typically lead to the team members establishing procedures and protocols for accomplishing their work in the norming phase (Tuckman & Jensen, 1977). Because we do not expect this to completely happen naturally we try to compensate for this by imposing certain roles; i.e. each team member gets a material assigned they can buy. This rule also encourages the team to include everyone in the decision process. In a real life situation the decision process would typically naturally be established in the norming phase as well. The last two stages ‘performing’ and ‘adjourning’ will not be discussed because they are
not of importance to this study and we do not expect these stages to occur due to the short
time this team will spent together. This activity will take about 20 minutes.

Experimental condition. In the experimental condition the participants will go through
eight different activities. The first activity ‘Introduction’, the fourth activity ‘Blindfold rope
task’, the seventh activity ‘Questionnaires’ and the eighth activity ‘Marshmallow challenge’
are exactly the same as their counterparts in the control condition.

The second activity is called the ‘Ball throwing game’ and is very similar to the one in
the control condition. The difference is the amount of turns each group member gets, which is
three. Consequently this activity will take less time, about 3 minutes.

The third activity is called ‘Map of the world game’ and is very similar to the one in
the control condition. The difference is that the participants are asked to tell something about
a life event in only one or two sentences, compared to speaking freely about a life event.
Consequently this activity will take less time, about 5 minutes.

The fifth activity is called the ‘LSD mini lecture’. This activity is added compared to
the control condition and is the main manipulation task. In this activity the principles of the
‘Luisteren Samenvatten Doorvragen’ tool will be discussed and how the tool can be applied in
practice. The reason for this activity is to manipulate the independent variable
communication. The LSD tool is known for facilitating clear and open communication
(Donders, 2008; Lang & Molen, 2003). In this research we see clear and open communication
as part of the effective team aspect ‘good communication‘. Although there is no conclusive
evidence we expect that applying the LSD tool might also increase cohesion, so this will be
measured as an independent variable as well. This activity will take about 10 minutes.

The sixth activity is called the ‘Blindfold rope task’ and is very similar to activity four.
The only difference is the figure that the participants are asked to lay on the floor. The reason
for this activity is to give the participants a chance to apply the LSD tool in practice and let
them experience that this tool can help them communicate better, making the task easier. This activity will take about 5 minutes.

**Measures**

In this experiment ‘communication’ and ‘cohesion’ will be measured as independent variables and ‘return of investment’ will be measured as dependent variable.

*Communication.* We defined ‘good communication’ with the aspects of clear and open communication, giving and receiving constructive feedback and jointly making decisions. These four aspects will be measured by an adapted version of the ‘ACP 360 Self assessment and colleague questionnaire’ (Lelliott, et al., 2008; Royal College of Psychiatrists [RC Psych], 2012). The original ACP 360 questionnaire has a broad range questions, so questions that are not relevant for this experiment were removed in the adapted version. Since the experiment is completely conducted in Dutch, the questions were also translated from English to Dutch. The adapted version consists of 17 items. These items are scored on a 5-point scale ranging from 1 “Helemaal mee oneens” to 5 “Helemaal mee eens”. The items 13 and 16 on the adapted questionnaire are reverse coded. In this experiment we are interested in the differences between teams, so a mean team score will be calculated over the three individual team members’ scores. The adapted version of the questionnaire can be found in Appendix D.

*Cohesion.* Group cohesion is measured using an adapted version of the Group Climate Questionnaire-23, in short GCQ-23 (NVGP, 2013; Trijsburg, 2006). The original GCQ-23 questionnaire is developed for a group therapy context, so questions that are not relevant for this experiment were removed in the adapted version. Questions did not needed to be translated since the GCQ-23 is available in Dutch. The adapted version consists of 17 items. These items are scored on a 6-point scale ranging from 1 “Erg mee oneens” to 6 “Erg mee eens”. The items 4, 6, 9, 11 and 16 on the adapted questionnaire are reverse coded. In this experiment we are interested in the differences between teams, so a mean team score will be
calculated over the three individual team members’ scores. The adapted version of the questionnaire can be found in Appendix E.

*Return of investment.* Return of investment in this experiment is seen as a function of the costs per centimeter of height of the tower that the teams will have to build as their last activity. Return of investment is calculated as \( \text{ROI} = \frac{(N_{\text{Materials used}} \times 500)}{h} \). ROI is Return Of Investment. \( N_{\text{Materials used}} \) is the total number of materials that the team bought. Five hundred is the price per material in euros. Finally, \( h \) is the height of the tower in centimeters. This is measured from the table the tower stands on to the top of the marshmallow. Counter intuitively this means that the lower the return of investment score, the better.

**Results**

As mentioned in the method, towers that fell down under the weight of the marshmallow were removed from the sample. To make sure there is no association between the condition that teams were in and whether or not their tower fell down a Chi Square-statistic is run. There was no significant association between the condition and whether or not the tower fell down \( \chi^2 (1) = 1.50, p = .266 \). So these cases are removed from the final sample. Cronbach’s alpha was calculated as the reliability statistic of the communication and cohesion questionnaires. Both questionnaires had a high reliability, Cronbach’s \( \alpha = .89 \).

Next the communication, cohesion and ROI variables are made an aggregate of the team members’ individual scores. The mean values of the aggregates are illustrated in table 1, median values for ROI are also included because ROI is not normally distributed.
Table 1

*Mean/Median and Standard Deviations for ROI, communication and cohesion, per condition*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Return of investment (ROI)</th>
<th>Communication</th>
<th>Cohesion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M (SD)</td>
<td>Mdn</td>
</tr>
<tr>
<td>Control</td>
<td>23</td>
<td>241.31 (97.01)</td>
<td>212.77</td>
</tr>
<tr>
<td>Experimental</td>
<td>26</td>
<td>307.55 (251.53)</td>
<td>233.11</td>
</tr>
</tbody>
</table>

Before the statistical analyses are run per hypothesis, the K-S test is used to check if ROI, Communication and Cohesion are normally distributed per condition for hypothesis 1, 2 and 5. Return of investment scores significantly deviate from normality in both the control condition, $D(23) = .21, p < .05$ and in the experimental condition, $D(26) = .24, p < .001$. Communication scores do not significantly deviate from normality in both the control condition, $D(23) = .16, ns$ and in the experimental condition, $D(26) = .11, ns$. Cohesion scores do not significantly deviate from normality in both the control condition, $D(23) = .17, ns$ and in the experimental condition, $D(26) = .12, ns$. The K-S test is used to check if Communication and Cohesion are overall normally distributed for hypothesis 3 and 4. Communication scores do not significantly deviate from normality overall, $D(49) = .09, ns$. Cohesion scores do not significantly deviate from normality overall, $D(49) = .08, ns$. The remainder of this paragraph will discuss the results per hypothesis.

**Hypothesis 1.** To examine the results of this hypothesis, a T-Test is used because the parametric assumptions are satisfied. On average the amount of communication is not significantly different in the experimental condition ($M = 4.19, SD = 0.30$) compared to the control condition ($M = 4.18, SD = 0.28$), $t(47) = -.22, p = .829, r = .03$. This means that hypothesis 1 is not supported.
Hypothesis 2. To examine the results of this hypothesis, a T-Test is used because the parametric assumptions are satisfied. On average the amount of cohesion is not significantly different in the experimental condition \((M = 4.75, SD = 0.43)\) compared to the control condition \((M = 4.76, SD = 0.32)\), \(t(47) = .09, p = .926, r = .01\). This means that hypothesis 2 is not supported.

Hypothesis 3. To examine the results of this hypothesis, a Spearman correlation is used because ROI is not normally distributed, not satisfying parametric assumptions. Communication is not significantly related to return of investment, \(r_s = -.08, p = .575\). This means that hypothesis 3 is not supported.

Hypothesis 4. To examine the results of this hypothesis, a Spearman correlation is used because ROI is not normally distributed, not satisfying parametric assumptions. Cohesion is not significantly related to return of investment, \(r_s = .01, p = .934\). This means that hypothesis 4 is not supported.

Hypothesis 5. To examine the results of this hypothesis, the Mann-Whitney test is used because ROI is not normally distributed, not satisfying parametric assumptions. The amount of ROI did not significantly differ in the experimental condition \((Mdn = 233.11)\) compared to the control condition \((Mdn = 212.77)\), \(U = 281.00, z = -.361, p = .724, r = .01\). This means that hypothesis 5 is not supported.

Conclusion and discussion

In this paper we tried to find an answer to the question “Does team building actually lead to better performance and consequently a higher return on investment?” We presented four steps to measure this in an objective way. Five hypotheses were constructed based on the chronological order of the four steps. With these five hypotheses we tested if the team building activity LSD mini lecture would lead to better communication and cohesion,
consequently leading to a better return of investment. Contrary to our expectations, none of the hypotheses were supported.

Although none of the hypotheses were supported, this does not necessarily mean that the chosen team building activity cannot lead to better performance and a higher return of investment. In the hypotheses 1 and 2 communication and cohesion scores are compared between conditions. Both hypotheses are not supported. This could suggest that LSD mini lecture manipulation might not have been strong enough. Applying the LSD tool takes practice and might feel awkward at first (Verhoeven, 2011), because of this team members might be hesitant to use it. Although not objectively measured, the experimenters had the feeling that the LSD tool was not applied during the ‘Marshmallow challenge’. The results of hypothesis 5 show that ROI did not differ significantly between conditions. This means that none of the measured variables differ per condition. So we expect that the manipulation task was not strong enough.

The relation between communication and ROI and the relation between cohesion and ROI was tested in hypothesis 3 and 4. No significant relation was found. This suggests that communication and cohesion do not influence the return of investment. A possible explanation for this is that the dependent variable ROI is measured using the quite unusual task of building a spaghetti tower. Since most participants do not have a reference point on how to build such an unusual tower and given that only a limited number of groups took part in the experiment, it might be possible that other factors played a much more important role in finishing this task. For example creativity could be much more important, a team could only need one great idea to build a high tower at low costs. Creativity can be seen as part of ‘Right mix of KSA’. So to measure return of investment for the LSD team building activity, the ‘Marshmallow challenge’ possibly needs to be adapted. The participants could be given a global idea of a possible design for their tower, for example. This would also mean that the
task complexity has to be made more difficult in another way so that communication is still encouraged, for example by adding extra materials.

A last limitation of this research is the sample size. For a predetermined effect size of 0.30, alpha of 0.05, power 1-\( \beta \) of 0.80 and two groups, a total sample size of 90 groups is required. We only tested a total of 49 groups.

From these results we can conclude that in this experiment the LSD mini lecture did not improve communication, cohesion and consequently task performance, but with a few improvements it still might. This also means that in this paper we also made a small start to answer the question if team building leads to better performing teams. In this experiment it did not, but as discussed in the introduction, a lot of other factors need to be researched.

We recommend future studies to use the steps presented in the introduction to measure team building effectivity. This will lead to an unbroken chain of relations from team building activity to organizational outcomes that can be measured objectively. Objective measures and precisely defined concepts are key to get a good understanding of how different team building exercises do or do not influence team performance and organizational outcomes.
References


DOES TEAM BUILDING LEAD TO BETTER PERFORMING TEAMS?


Appendix A

Below please find the consent form that participants have to agree to.

---

Het doel van deze studie is het onderzoeken van groepsprocessen. In deze studie zal je verschillende taken in een groep van drie personen uitoefenen. Daarnaast zul je enkele vragenlijsten beantwoorden. De studie duurt ongeveer een uur. Aan het eind van de studie zul je een proefpersoon uur of €8, - als vergoeding ontvangen voor je deelname. Als je besluit je terug te trekken uit de studie ontvang je deze vergoeding niet.

Er zijn geen fysieke of emotionele risico’s in dit onderzoek. Er zijn, naast de vergoeding, ook geen directe voordelen voor jou als proefpersoon. Het is toegestaan om participatie te weigeren en je terug te trekken van het onderzoek op ieder moment zonder dat daar negatieve gevolgen tegenover staan. Individuele privacy zal worden gewaarborgd in alle gepubliceerde en geschreven data die resulteert uit de studie. Geen persoonlijk identificeerbare informatie zal kenbaar gemaakt worden aan de onderzoekers. Je ANR en naam zullen alleen gebruikt worden om proefpersonen bij te schrijven. Deze gegevens zullen apart gehouden worden van de verdere data.

Dit onderzoek loopt de hele maand Februari, we verzoeken je dan ook het onderzoek niet met medestudenten te bespreken omdat dit de resultaten zou kunnen beïnvloeden.

Als je vragen hebt over het onderzoek of de procedures voel je dan vrij om contact op te nemen met één van de onderzoekers: D. Rietveld (d.rietveld@tilburguniversity.edu), J.J. Mamadeus (j.j.mamadeus@tilburguniversity.edu), M.M.A. Heidenrath (m.m.a.heidenrath@tilburguniversity.edu), M.P. Grootendorst (m.p.grootendorst@tilburguniversity.edu). Of met onze begeleider Dr. M. Stel (m.stel@tilburguniversity.edu, tel: 013 466 874).
Appendix B

Below please find the text that participants will get to read about the actual idea behind the experiment.

Het effect van teambuilding op objectieve prestatie.

Het doel van het experiment is onderzoeken wat het effect is van teambuilding op objectieve prestatie. Op basis van voorgaand onderzoek hebben de onderzoekers de hypothese opgesteld dat mensen die een op communicatie gebaseerde teambuilding krijgen, beter presteren in een objectieve prestatie taak. De reden hiervoor is de aannames dat teams die beter communiceren en hoger scoren op cohesie, beter in staat zijn om effectieve beslissingen te maken tijdens het groepsproces.

In deze studie worden honderd groepen van drie deelnemers getest in twee condities bestaande uit elk vijftig groepen. In de experimentele conditie kregen de deelnemers een op communicatie gebaseerde teambuilding voor de objectieve prestatie taak. De controle conditie kreeg geen teambuilding voor deze taak. De objectieve prestatie taak werd gemeten aan de hand van de hoogte van de toeren en het aantal materialen dat voor de toeren gebruikt werd.

Alle verzamelde data worden strikt vertrouwelijk en anoniem behandeld. Namen van de deelnemers zullen niet gebruikt worden en data kan alleen worden ingezien door mensen die betrokken zijn bij het onderzoek.

Wij willen u hartelijk bedanken voor uw deelname aan dit onderzoek. Als u op- of aanmerkingen, klachten of vragen heeft kunt u contact opnemen met één van de onderzoekers: D. Rietveld (d.rietveld@tilburguniversity.edu), J.J. Mamadeus (j.j.mamadeus@tilburguniversity.edu), M.M.A. Heidenrath (m.m.a.heidenrath@tilburguniversity.edu), M.P. Grootendorst (m.p.grootendorst@tilburguniversity.edu). Of met onze begeleider Dr. M. Stel (m.stel@tilburguniversity.edu, tel: 013 466 874).

Nogmaals hartelijk bedankt voor uw deelname!
Appendix C

Below please find the instructions of the team building activities as PowerPoint presentations. *If you are reading the paper version of this document please download the PowerPoint presentations from http://1drv.ms/1pjwxk0*

**Control condition**

**Experimental condition**
Appendix D

Below please find the communication questionnaire.

Lees de onderstaande stellingen en bepaal in hoeverre deze stellingen van toepassing zijn voor de opdrachten die je zojuist met de groep hebt uitgevoerd.

<table>
<thead>
<tr>
<th>1 = Helemaal mee oneens</th>
<th>2 = Mee oneens</th>
<th>3 = Noch mee eens, noch mee oneens</th>
<th>4 = Mee eens</th>
<th>5 = Helemaal mee eens</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. De teamleden luisteren actief naar elkaar.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>2. De teamleden geven elkaar de gelegenheid om hun mening te uiten.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>3. De teamleden delen relevante informatie met elkaar met betrekking tot de taak.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>4. De teamleden communiceren duidelijk en helder naar elkaar.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>5. De teamleden staan open voor suggesties van alle leden.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>6. De teamleden maken beslissingen op basis van inbreng/informatie van alle teamleden.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>7. De teamleden zijn bereid om elkaar te confronteren met problemen of onduidelijkheden.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>8. De teamleden zijn in staat om consensus te bereiken over meningsverschillen.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>9. De teamleden staan open voor het krijgen van feedback.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>10. De teamleden dragen iets bij aan het groepsproces.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>11. Ik luister actief naar mijn teamleden.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>12. Ik geef de teamleden de gelegenheid om hun mening te uiten.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>13. Ik praat veel over zaken die niets met de taak te maken hebben.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>15. Ik sta open voor suggestie van mijn teamleden.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>16. Ik sta niet open voor feedback van het team.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>17. Ik neem actief deel aan het groepsproces.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
Appendix E

Below please find the cohesion questionnaire.

Lees de onderstaande stellingen en bepaal in hoeverre deze stellingen van toepassing zijn voor de opdrachten die je zojuist met de groep hebt uitgevoerd.

<table>
<thead>
<tr>
<th>Stelling</th>
<th>1 = Erg mee eens</th>
<th>2 = Mee eens</th>
<th>3 = Een beetje mee eens</th>
<th>4 = Een beetje mee eens</th>
<th>5 = Mee eens</th>
<th>6 = Erg mee eens</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Over het algemeen doet iedereen mee in deze groep.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>2. In een andere, soortgelijke, groep zouden er wat mij betreft dezelfde soort mensen in mogen zitten als nu.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>3. Ik voel me betrokken bij wat er in de groep gebeurt.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>4. Deelname aan deze groep levert mij weinig op (denk hierbij niet alleen aan eventuele proefpersoonuren of een gedeelijke vergoeding).</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>5. Er zijn mensen in de groep die ik als persoon graag mag.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>6. De groep laat me koud.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>7. Ik probeer met groepsleden mee te denken als ze ergens niet uitkomen.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>8. Na deze bijeenkomst zou ik de mensen uit deze groep willen blijven ontmoeten.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>9. Ik voel me buiten de groep staan.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>10. Ik vind dit een prettige groep.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>11. Ik schiet maar weinig op met deze groep.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>12. Er zitten mensen in de groep met wie ik ook buiten deze bijeenkomst zou willen omgaan.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>13. In deze groep werken we goed samen.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>14. Ik voel me geaccepteerd door de groep.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>15. De groep vormt een eenheid, ook al zijn er individuele verschillen.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>16. Ik voel afstand tussen sommige groepsleden en mijzelf.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>17. De uitgevoerde activiteiten met deze groep bevorderen mijn persoonlijke ontwikkeling.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>